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| Chlorcosane Per 4 ozs. | .80 | | |
| Per 16 ozs. | 2.30 | | |
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| Digipoten, Tablets, gr. 1/4 | .62 | 2.45 | 4.65 |
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| H-M-C, No. 2, Per tube of 25 tablets | .91 | | |
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| Lubrin, Per 3-oz. tube | .60 | | |
| Mercury-Antidote (Carter) | 1.36 | 6.35 | 12.10 |
| Neuro-Lecithin | .89 | 3.90 | 7.40 |
| Neutral Sodium Soap Per 8-oz. bottle | 1.00 | | |
| Per 16-oz. bottle | 1.50 | | |
| Nuclein Solution (Oral) Per 1-oz. bottle | .40 | | |
| Nuclein Solution (Special Hypodermic) Per box of 12 2-Cc. ampules | 1.60 | | |
| Parresine, Per lb. (2 cakes) | 1.35 | | |
| Parresined Lace-Mesh Surgical Dressing Per box of 6 envelopes, each containing a strip 6 X 18 inches | 1.60 | | |
| Per 10-yd. roll, 6 inches wide | 3.50 | | |
| Per 50-yd. roll, 6 inches wide | 15.50 | | |
| Petrochondrin Per 16-oz. bottle | 1.25 | | |
| Per half-gallon bottle | 4.40 | | |
| Pituitary Solution (Liquor Hypophysis, U. S. P.) Per box of 6 1-Cc. ampules | 1.65 | | |
| Per box of 6 ½-Cc. ampules | 1.15 | | |
| Procaine, Powder, Per 5 grams | 2.00 | | |
| Procaine, gr. ½. Per tube of 20 tablets | .45 | | |
| Procaine, gr. ½, with Adrenalin, gr. 1/2500 | | | |
| Per tube of 20 tablets | .50 | | |
| Procaine, gr. ½, with Adrenalin, gr. 1/1500 Per tube of 20 tablets | .50 | | |
| Procaine, gr. ¾, Per tube of 20 tablets | .75 | | |
| Rheumatic (Candler) No. 1 | 1.51 | 7.10 | 13.35 |
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| Saline Laxative Per doz. bottles, small size | 5.40 | | |
| Per bottle | .45 | | |
| Per doz. bottles, medium size | 8.40 | | |
| Per bottle | .70 | | |
| Per doz. bottles, large size | 20.40 | | |
| Per bottle | 1.70 | | |
| Salithia Per doz. bottles, small size | 6.60 | | |
| Per bottle | .55 | | |
| Per doz. bottles, medium size | 10.80 | | |
| Per bottle | .90 | | |
| Per doz. bottles, large size | 26.40 | | |
| Per bottle | 2.20 | | |
| Sodoxylin Per doz. bottles | 8.40 | | |
| Per bottle | .70 | | |
| Tasnicide Per 2-oz. bottle | 1.40 | | |
| Per box of 12 capsules | 2.05 | | |
| Thalocal | .39 | 1.30 | 2.35 |
| Thalosen | .72 | 3.00 | 5.70 |
| Tonsilitis | .27 | .70 | 1.20 |
| Triple Arsenates with Nuclein, No. 1 | .38 | 1.25 | 2.25 |
| Turpenol, Per 8-oz. bottle | .60 | | |
| Uterine Sedative and Nervine (Candler) | .53 | 2.00 | 3.75 |
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THE AMERICAN
# JOURNAL OF PHARMACY

*MARCH, 1920*

## EDITORIAL.

### THE RESPONSIBILITY OF PHARMACY UNDER PROHIBITION ENFORCEMENT.

The various acts of national legislation leading up to the enactment of prohibition as well as the prohibition enforcement act, have all recognized the use of distilled spirits and wines as medicines. The Volstead Act, more distinctly than its predecessors, takes cognizance of such legitimate use of alcoholic liquors, and attempts to provide the procedure by which the needs of the public for such as medicine can be supplied.

We have reason to believe that in the drafting of this portion of that act careful consideration was given to this subject as one that under the existing knowledge and status of the practice of medicine must be provided for as a public necessity. In the exercise of its law-making prerogative, Congress very properly determined that the use of distilled spirits and wines as medicines must be provided for but that the prescribing and dispensing must be done through the proper channels of professional medical practice and that protective measures must likewise be adopted to restrict the dispensing of these to bona fide prescriptions.

We believe that the Volstead act is the first law enacted by the Congress of the United States that clearly recognizes that pharmacy is a distinct branch of medicine; that its function is to dispense all medicines and that dispensing, even of alcoholic liquors, can be controlled through the profession of pharmacy. This is a principle for which pharmacists have been contending for a long time and the importance of its establishment in the jurisprudence cannot now be fully estimated.

President LaWall, in his presidential address before the American Pharmaceutical Association, considered that this was to be viewed

as an evidence of confidence in the profession of pharmacy and likewise expressed his opinion that as a whole pharmacy would measure up to this added responsibility. It is evident from the discussions appearing in the pharmaceutical press that many of those engaged in the drug trade entertain different views, and what is even more apparent is the lack of careful reading and digestion of the law and the regulations covering these features of its enforcement.

The fear that any number of "weak brothers" in pharmacy will see an opportunity of reaping "easy money" by infracting this law and by their misdeeds discrediting the entire profession, seems to be one of the stock arguments. The regulations provided for the protection against such violations are certainly stringent, and foolish indeed will be the druggist who engages in "booze selling." He may be assured that sooner or later his transgressions will be discovered and the merited punishment meted out. The penalties are by no means light and both medicine and pharmacy should purge their professions of the violators of anti-liquor and anti-dope laws. In our opinion the dispensing of all medicines that are abused or habit-forming must be restricted to the legitimate medical professions, each functioning within its own proper field of service. This is evidently the intent of the enforcement act as it relates to the use of liquors as medicines, and as its full force and effect become established, the infractions must become notably less and the "weak brothers" either will not appear or will have disappeared.

We share fully the opposition of the pharmacists to being classified as retail liquor dealers. The classification never was appropriate to those engaged in the vocation of the apothecary and now that dealing in beverage alcoholic liquors is outlawed, we hope forever, the necessity for the Treasury Department maintaining the "R. L. D." class has certainly ceased to exist. Pharmacy should congratulate itself and the lawmakers that in the enforcement act "pharmacist" is the term used and that professional title is used to designate the class alone upon whom the responsibility for the proper dispensing of such medicines is placed. The pharmacists are entirely right in demanding that the odium of the retail liquor dealer should not fall upon them in the discharge of what the law now makes a part of their professional duty.

It appears that in maintaining the classification of "R. L. D." the Treasury Department is carrying out the laws now on the statute books, and that to relieve the pharmacists of this objectionable

classification and tax, remedial legislation will have to be enacted. In directing attention to this needed legislation, to correct what is an error on the part of the Government, we do so because of the importance of its bearing at this time. Many self-respecting pharmacists are deterred from dispensing bona fide prescriptions for alcohol or alcoholic liquors because of their objection to taking out the permits and qualifying as now required, and to being classified as Retail Liquor Dealers. As a result, in many sections of the country, physicians are having trouble in having these prescriptions dispensed and the pharmacists are being severely criticized for failing to discharge their duty to the public.

Presumably the pharmacists of the United States want the law modified so that they will no longer have to bear the odium of being liquor dealers. This can only be accomplished by a determined effort that will convince the members of Congress of the real facts. We believe that this object can be attained by a united effort of the drug trade interests and are prepared to lend our utmost efforts in that direction. In the meantime, will pharmacists gain either prestige or public endorsement of this proposition by shirking a responsibility that Congress has already imposed?

The decision as to what is or is not a medicine does not primarily rest upon the pharmacist. The physician has the responsibility of diagnosing and of prescribing whatever remedies he deems are appropriate. Upon the pharmacist devolves the duty of properly compounding and dispensing whatever the physician in his judgment may determine is the medicine required. In the discharge of such professional duty, the pharmacist is not concerned whether this judgment dictates doses of a toxic or a narcotic, an alcoholic remedy or even a placebo. With equal grace and skill and without diminishing in the least his professional spirit, he can dispense any of these or other medicines. The hue and cry against bona fide dispensing of stimulants, in the opinion of the writer, is not justified by any code of professional ethics. The countenancing of any dispensing that is not bona fide, either alcoholic, narcotic or for any other improper motive or use, is beyond the pale of professionalism and should be outlawed, and a pharmacist has at all times the right to refuse to sell or dispense any or all medicines that he either knows or suspects are not to be applied to legitimate practice.

The suggestion has been made by pharmacists in several sections of the country that the government should establish dispensaries

for the dispensing of prescriptions calling for liquors. No provision has been made in the law for any such procedure, and the Internal Revenue Department would not be justified in establishing such a method of dispensing until so directed by Congressional enactment.

It is exceedingly doubtful if government dispensaries would be either a practicable or an efficient means of protecting against the illicit use of such spirits.

The shirking of the responsibility placed upon pharmacy by this Congressional enactment is not without the possibility of working to the detriment of pharmacy. If pharmacists refuse to accept the responsibility placed upon them by the government to dispense distilled spirits and wines *for medicinal purposes*, and insist that prescriptions for such must be compounded only in government dispensaries, the public and legislative bodies may construe this as an indication that the pharmacists are not discharging their professional duties. If such a procedure were to be adopted regarding the dispensing of alcoholic stimulants, it might be considered as a precedent for the same course regarding narcotic drugs or toxic remedial agents, and the profession of pharmacy certainly would be destroyed if such a procedure was to be carried out to its possible conclusion.

It appears to us that it is the duty of pharmacists to accept the responsibility placed upon them by this enactment and fulfill same in a professional spirit. The following sensible view of the situation is presented by George Victor Haering, of Chicago, in the *C. R. D. A News* and republished in the *N. A. R. D. Journal*, of February 26, 1920:

"Inasmuch as the Government has recognized liquor as a medicine and a medicine only and left it to the discretion of physicians so to prescribe, and in its judgment realized that the registered pharmacist by virtue of his high standing as regards character, reliability and honesty was the one best qualified to dispense and handle same, I for one have taken out a license, realizing that many millions in this country believe sincerely in the medicinal virtues of liquor and I am not the judge, but merely the 'order taker' when filling aforesaid prescriptions written according to the precepts of the law.

"The confidence bestowed upon me by the Government in permitting me to dispense narcotics and liquors shall not be betrayed, as I fully realize the high honor thus bestowed upon me as a pharmacist as well as my duty as an American citizen." G. M. B.

## THE FAULTS OF MEDICAL EDUCATION.

In this number of the JOURNAL we republish the paper of Hobart Amory Hare, M.D., on the "Teaching of Therapeutics," published in the *Journal of the American Medical Association.*

Our purpose in republishing this article is twofold. First, it is a frank statement by an eminent authority of a great fault in the current medical education. The neglect of the medical schools to impart to their students a sufficient medical education that will enable them to intelligently practice their important profession is a serious indictment of the educational methods employed in colleges of medicine.

Many pharmacists no doubt could relate instances of the lack of knowledge of materia medica and practical therapeutics exhibited by physicians, and by their experiences attest the truthfulness of the criticism of Prof. Hare that many of the young physicians entering medical practice have no clear understanding of posology and the true significance of a *dose.* The examples he gives in this article of the lack of acquaintance with official titles are duplicated in a great many of the prescriptions presented for compounding.

It is unfortunate that this arraignment of the lack of knowledge on the part of many physicians, and the faulty methods of teaching in vogue in medical schools is true.

The need for a more thorough and a more practical method of training the medical student to prescribe, and the plan suggested for correcting this defect, should receive the merited consideration, and likewise the necessity for having instruction imparted by those who have gained the knowledge they wish to impart through actual practice.

Our second purpose in republishing this paper is its applicability likewise as a lesson to pharmaceutical educators. To a more or less degree the same faults in the method of imparting knowledge by teachers utterly lacking in experience is, likewise, evidenced in many of the schools of pharmacy. Post-graduate courses in medicine or in pharmacy should be based on a *comprehensive knowledge* and prior education in the fundamental branches of these practices and reserved for specialists who will not only apply the knowledge acquired in post-graduate work, but extend the existing knowledge in these fields through their further practice and research therein.

It is not our purpose to cast any reflection upon our friends of

the medical profession. We are of the opinion that pharmacy has too many glass houses to safely engage in "stone-throwing," and the insufficiency of our pharmaceutical education is a topic that it is proposed to editorially discuss in an early issue. G. M. B.

## FURTHER MODIFICATIONS OF THE REGULATIONS FOR PROHIBITION ENFORCEMENT.

In our editorial comments we have taken exception to the requirement of the regulation No. 60 that bay rum, hair tonics and other toilet preparations must be denatured by the addition of tartar emetic. Throughout the trades affected by this early promulgation of the Federal Prohibition Commissioner, there has been a very pronounced opposition to this ruling. The Department has now modified this in a mimeographed regulation known as Prohibition Mimeograph No. 38, which sets forth four additional optional modifying agents that may be used in place of tartar emetic. These are quinine sulphate 2 grains to the fluid ounce, cinchonidine sulphate 2 grains to the fluid ounce, salicylic acid 5 grains to the fluid ounce and resorcin, 5 grains to the fluid ounce.

It is not improbable that further consideration will justify the Department in admitting as modifying agents the use of some other denaturing agents than those now specified.

This Bureau has likewise issued as Prohibition Mimeograph No. 40, a regulation regarding the reports of liquor sold by druggists on physicians' prescriptions. This reads as follows:

"A report on Form 1418 has been prepared to be rendered by druggists and pharmacists each month, showing the number of prescriptions filled and the quantity of liquor sold on physicians' prescriptions.

"Form 1418 must be made in triplicate each month by the holder of each permit to dispense intoxicating liquor for medicinal purposes on physicians' prescriptions written on Form 1403, or on emergency prescriptions as authorized by law.

"Two copies of the report on Form 1418 must be sent by the druggist holding permit, to the Federal Prohibition Director of the State on or before the fifth day of month succeeding the month for which the report is rendered; one copy will be retained by the druggist rendering the report.

"Liquors used in compounding medicines should not be reported on Form 1418, as this form is intended to be a report solely of liquors

sold as such on prescriptions of physicians holding permits to prescribe liquor; medicinal preparations fit for beverage purposes should, however, be included in the report on Form 1418.

"The report of druggists on Form 1418 should not include sales of liquor to other druggists or to physicians or hospitals, except on authorized prescriptions, nor sales of liquor for industrial or scientific purposes; it should include only such liquors as are dispensed and sold on authorized prescriptions of practicing physicians to parties for medicinal use.

"One copy of the druggists' monthly report on Form 1418 will be retained by the Federal Prohibition Director, and one copy will be forwarded to the Federal Prohibition Commissioner at Washington, D. C., together with Form 1419.

"The Federal Prohibition Director will report each month on Form 1419, entering thereon the names and addresses of each druggist or pharmacist holding permit to dispense liquor on physicians' prescriptions. Upon receipt of Forms 1418 from druggists, the Director will enter on Form 1419 opposite the name of the druggist the number of prescriptions filled during the month, and the quantity of each kind of liquor sold.

"Report on Form 1419 should be rendered promptly each month, not later than the tenth day following the month for which it is rendered, notwithstanding the Director may not have received Forms 1418 from all druggists holding permits to dispense liquor on physicians' prescriptions. The name of each druggist holding such permit must be listed on Form 1419.

"When the quantity of liquor sold and the number of prescriptions filled cannot be entered on Form 1419 by reason of the failure of druggists to file Form 1418, the Director will not later than the last day of the month render a supplemental report on Form 1419 of all returns on Form 1418 received by him from druggists after his regular report for the month on Form 1419 has been rendered. The supplemental report on Form 1419 must contain a list of all druggists listed on the regular report and from whom no return on Form 1418 had been received when the regular report on Form 1419 was made by the Director. When a druggist has failed to file his return at the end of the month, action should be taken looking to the revocation of his permit, unless a good and sufficient reason shall be shown for the delinquency in filing his return.

"When a return on Form 1418 is not filed with the Director on or

before the tenth of the month by any druggist holding permit, the Director will call upon such druggist to render his return on Form 1418 at once.

"Report on Form 1418 by druggists will not be required for any month prior to March, 1920. Reports for March and for each month thereafter will be required to be rendered by each person holding permit to dispense liquor on physicians' prescriptions. If such permit is issued to any person during any month, a report must be rendered by the permittee for the remainder of the month after receiving his permit, and for each month thereafter during the life of the permit.

"When the Prohibition Director for the State is not yet appointed or whose office is not yet established, the Collector or Collectors of Internal Revenue in such State will be required to receive Forms 1418 from druggists and list the same on Form 1419.

"Before supplying druggists with blank copies of Form 1418, following the word "at" and under the words "To Federal Prohibition Director," the Director will write or stamp the name of the city and state where his own office is located, in order that druggists may be advised as to where the report is to be sent.

"Directors will note on the back of Forms 1418 the date when received from druggists. This notation may be made with a rubber stamp, care being taken to indicate clearly the date when received in the Director's office."

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## OBLIGATIONS AND METHODS OF RESEARCH.[1]

By Henry Leffmann, A.M., M.D.,

Lecturer on Research, Philadelphia College of Pharmacy.

The primary object of science is the determination of truth. It is not essential to this object that the truth shall have an obvious value to mankind. The study of the properties of magic squares is, from the purely philosophic point of view, as commendable as the study of the cause and cure of cancer. It is, however, the dominant feature of present science to make it "practical," that is, yielding data that can be turned to account either in increase of wealth or

[1] Abstract of an address delivered by invitation at a meeting of the Faculty of the Philadelphia College of Pharmacy, November 24, 1919.

increase of comfort and enjoyment. A strong contrast is to be noted between the relations of the ancient and modern scientists to their respective communities. In ancient times the scientist stood apart from the practical life, disdaining, as a rule, the investigation of agricultural and industrial problems. Socrates rebuked one of his disciples for suggesting that the study of astronomy might have practical value in navigation or otherwise. It is pursued, he said, as an ennobling influence. To-day, the cause of science is urged upon the public almost wholly on the basis that material benefits will result from it. The student who enters upon a course of study in any science, does so almost always with a practical application in view, and this is especially true of the students at professional schools. Hence, in the great mass of cases, we pass over the loftier aims of science, "pure science," as it is called, and take up the practical side, technically known as "applied science."

There is, however, one sentimental phase that must not be forgotten, namely, that there rests upon every scientific worker the duty of contributing something to the stock of knowledge. The vast mass of information now available is almost wholly the free contribution of previous workers, and every one who practices a profession that applies such information, or who pursues the study of science for itself alone, should bear in mind the previous workers who have handed the torch to him, and should feel the obligation to pass it on still brighter to those who come after him.

It is given, it is true, to but few mortals in any age, to be possessed of that special ability which we call genius. It is a term difficult to define. Perhaps the only definition available is the merely epigrammatic one that "genius is the infinite capacity for taking trouble." It is a great mistake, however, to assume that research can be conducted only by a favored few. Epoch-making discoveries constitute but a small part of the development of science, the greater part of its literature is minor detail, the value of which is cumulative. It is, therefore, within the power of all to add something to the store. Let me indicate some of the lines along which this may be done.

Every investigation should be preceded by a search in the literature. It will often appear that the line intended to be followed will be found to have been already surveyed if not actually opened. At every turn in science, we are apt to be impressed by the truth of Sydney Smith's remark about "those confounded ancients who anticipated everybody." I recall that some years ago I thought I

had devised a new method of obtaining photographs, the use of a gelatin film containing mercurous iodide. I deemed it best, however, to make some search in the matter and soon found the process had been published eleven years before I was born. It is still more disappointing to find out that some ancient Greek anticipated one in some discovery.

Yet an important observation must be made here, namely, that while the literature of science contains a very large mass of information, it must not be accepted without question. Experience shows that even the most capable of investigators may be seriously misled. This is due to several causes. Preconceived notions often blind ablest men to the real facts of the case. The mind too often perceives what it wants to perceive. Even in the material environment of the analytic laboratory, feeling and prejudice are not wholly lacking. A more frequent cause of error is, however, the imperfections of methods of research, and the lack of thoroughness of information. Much as one may be astonished in examining the literature of a given subject, at the anticipations in results, one is often equally astonished at how much is taken for granted, and how such assumptions form the basis of further investigations. A striking instance of this occurred in the experience of my co-worker, Dr. William Beam, and myself. We had devised a process of analysis which depended on the use of a strong sodium hydroxide in glycerol, with operation at a moderately high temperature. It was vital to the practical value of the process that no decided action should take place between the alkali and the solvent, especially that no substances of low volatility should be formed. Now Watt's Dictionary, a well-known and carefully compiled work, stated definitely that when glycerol is heated with strong alkali, salts of some of the lower fatty acids are formed. If this was true, the process was worthless. Careful experiment showed that it was not true. A good quality of glycerol heated well above the boiling point of water with strong sodium hydroxide solution gave no appreciable traces of any of these acids. The explanation of the error is probably that the original investigator used, unknowingly, an impure glycerol. The observation dated from an early period when the methods of preparing and purifying glycerol were but imperfectly known. Probably the application of the substance to the manufacture of high explosives, in which an exceptionally pure article is needed, led mainly to the improvement in the quality of the commercial

article. Another example of the liability of initial investigators to error is the fact that one of the first tests given for detection of benzene is due to a then unsuspected impurity—thiophene—in the commercial forms of benzene. When this impurity was detected, it was found that benzene freed from it does not give the reaction. Revision of earlier work is a promising field of minor research.

Any research of moment involves the preparation of a bibliography, the list of authorities consulted. Much reform is needed along this line and I hope those of you who are present will be crusaders in this cause. I am referring to the frequent imperfect and erroneous references that one often meets. The most serious omission is the year of publication. This is often the most important item in the matter, yet many authors neglect it. The volume number, if the journal has one—the edition-date in the case of a book—must not be omitted. Volume numbers should never be given in Roman characters. These are, indeed, not troublesome in the smaller amounts, but are exasperating above a score or so. The system has nothing to recommend it. British writers are very fond of it, but the leading British journal for abstracts in chemistry—*The Journal of the Chemical Society*—has long since discarded the practice and gives volume number in the common numerals called usually Arabic, but believed by many to be of Hindu origin. It is gratifying to note that some scientific journals have discarded altogether volume numbering, using merely the calendar year. This is a move in the right direction. In preparing a bibliography large or small, each reference should be verified if possible, if not, a statement that it is based on a secondary source should be noted. The several items of each reference should follow in a uniform order, that is, the year should not come first in one item and the volume first in another item. Uniformity in this respect gives neatness to the page and convenience to the user.

The English-speaking research worker in any important science should be reasonably familiar with French and German. I know, of course, that at present there is a feeling of dislike for anything that comes from the second source, but in this matter we must be guided by self-interest and not by feeling. The ancients knew the value of obtaining information from any source, and in the Latin proverb, "*Fas est, et ab hostis doceri*," "It is allowable to learn from the enemy," they expressed the view. Plutarch wrote an essay of the same tenor. Great Britain and France have set us examples in this

respect. Though they have both suffered much more severely than we have from the German methods of warfare, they have both decided to increase rather than diminish their studies of the literature of their late enemy.

Speaking as I am on this occasion to those engaged in active teaching work, I feel that research in methods of teaching deserves special notice, especially as it is often overlooked. There is, in fact, at the present time, a tendency to minimize the lecture as a method of instruction, and to lay stress almost wholly on the laboratory and the practical side. I believe this to be an error. There is no attribute of humanity higher than intelligent speech, and there is no method better adapted to secure and maintain for a reasonable time the attention of a group of students than a well delivered lecture. I have long felt that our preparatory institutions, particularly those engaged in the training of teachers should devote much more time than is now devoted to instruction in lecturing. This cannot be obtained by the practice of reciting prose or poetry from some standard collection but must consist in exercises in speaking without notes, or at least with only outline notes, upon some topic for which the speaker has made special preparation. A crowd, whether of hoodlums or post graduates, has always something of the nature of a collection of wild animals into which the speaker enters. His safety lies largely upon keeping his eyes upon them. In lecturing, clear utterance, careful selection of phrases, simple language, are important. It is impossible to avoid technical terms in scientific teaching but in many cases ordinary words will serve. Illustrations of points by experiment are necessary but may be easily overdone. As far as the physical sciences are concerned, the laboratory hours afford the student much opportunity to perform illustrative experiments, so that the lecturer can give more time to explanation and direct statement. The modern extensive use of the lantern has one serious drawback—it keeps the room dark, thus taking away the supervision of the teacher and also interfering with note-taking.

These are some suggestions offered as a brief summary of the aid that can be rendered to the advancement of knowledge by those who have taken up its study and practice. The opportunities are immense. They are by no means limited to the abstruse and elaborate investigations that are now so regularly contributed by leading scientists. The nature of the atom and of force, the existence and properties of the ether, the exact determination of atomic weights,

these are problems that require extensive equipment, long training and special aptitude, but they constitute only a small portion of the field which is everywhere ripe to the harvest, and in which the humbler gleaner, with ruder tools can labor with benefit to science, both in its abstract and applied phases.

It is, as I said in the beginning, the duty of all to help in collection of data, either by adding new facts or correcting old statements or even classifying known data, and rendering them more easily understood or more accessible. Research should be undertaken intelligently, that is, with some clear object in view. It is true that some few important discoveries have been made by what seems to be accident, but it will be found that in most cases the discoverer was engaged in real and commendable investigation, and was not merely working at random.

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## NOTES ON SOY BEAN UREASE.

By Arthur W. Dox, Ph.D.,

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An enzyme capable of decomposing urea into ammonium carbonate was discovered in soy beans by Takeuchi[1] in 1909. Four years later Marshall[2] worked out a quantitative method for the determination of urea in urine by means of soy bean extracts. The method consists essentially in titrating the ammonia formed by the action of the soy bean extract upon the urea solution, using methyl orange as an indicator. Under the conditions described, the reaction was quantitative in three hours. A slight error, amounting to 0.8 per cent., due to carbon dioxide, was considered negligible in clinical work. In a second paper, Marshall[3] adapts the method to the determination of urea in blood, collecting the ammonia by aeration. Later, he[4] studied the activity of soy bean extracts, as affected by dilution, acids, alkalies and ethyl alcohol.

The properties of soy bean urease have been studied extensively

[1] *Jour. Coll. Agr. Tokyo.*, 1: 1, 1909.
[2] *Jour. Biol. Chem.*, 14: 283–90, 1913.
[3] *Ibid.*, 15: 487–94, 1913.
[4] *Ibid.*, 17: 351–61, 1914.

by Van Slyke and Cullen.[5] They found the optimum temperature to be about 55° C. Thirty minutes' heating with water at 60° was without effect, 30 minutes at 70° destroyed about one-fourth of the activity, and at 80° there was complete inactivation. Hydrolysis of urea by urease is not reversible.

It is not the purpose of this paper to review all of the literature. Commercial preparations of purified urease are now on the market and are being used extensively in urine analysis. In general it appears that urease is most abundant in seeds of high protein content, particularly in the Papilionaceae. Its absence, however, has been reported in beans, peas, cowpea, velvet bean and sweet pea.

Incidental to a study of various seeds to discover a possible correlation between enzyme activity and germinating power, the writer had occasion to compare the urease content of a number of soy beans of different varieties and germinating power. The only published work along this line appears to be that of Annett,[6] who examined six varieties of soy beans which he describes as yellow, cinnamon, chocolate, spotted, black and Rymbsa Ktang. His method consisted in treating 10 g. of powdered seed with 100 Cc. distilled water in the presence of toluene for one hour at room temperature. Two Cc. of the extract were added to 50 Cc. of a 1 per cent. urea solution, the mixture kept at room temperature (about 27° C.), and 5 Cc. aliquots titrated at half-hour intervals, using methyl orange as an indicator. The six varieties showed striking uniformity.

In the present work, 5 Gms. of each sample of soy beans were ground in a mortar and worked through a 40-mesh sieve. One-tenth of a gram of the powder was placed in a small Erlenmeyer flask, 15 Cc. distilled water at 40° added, then 10 Cc. of a 1 per cent. urea solution, after which the flask was stoppered and placed in a constant temperature bath at 40°. For purposes of comparison it was decided to allow the reaction to proceed for a period of time sufficient for the hydrolysis of about one-half of the urea. From the following table it will be seen that this point is reached in about 30 minutes. At intervals of ten minutes, one of a series of flasks containing the above mixture was removed from the bath and titrated with decinormal hydrochloric acid, using methyl orange as an indicator. A uniform blank of 0.6 Cc. was deducted in each case.

[5] *Jour. Biol. Chem.*, 19: 141–80, 1914.

[6] *Biochem. Jour.*, 8: 449–52, 1914.

TABLE I.

Seed No. 162,806. 0.1 Gm. powdered seed, 15 Cc. $H_2O$, 10 Cc. 1 per cent. urea solution, temperature 40°.

| Time in minutes. | Cc. *N*/10 HCl. | Time in minutes. | Cc. *N*/10 HCl. |
|---|---|---|---|
| 5 | 3.6 | 70 | 26.3 |
| 10 | 6.7 | 80 | 28.5 |
| 20 | 10.9 | 90 | 30.2 |
| 30 | 14.8 | 100 | 31.6 |
| 40 | 18.2 | 110 | 32.7 |
| 50 | 21.3 | 120 | 33.2 |
| 60 | 24.2 | 130 | 33.2 |

The theory for 10 Cc. of 1 per cent. urea is 33.3 Cc. The reaction was therefore quantitative in two hours under the conditions of the experiment.

It remained to be determined whether the method of preparation of the sample by grinding and sieving was sufficiently uniform for comparative tests. Each of the preparations used in the following experiment was ground separately.

TABLE II.

0.1 Gm. powdered seed, 15 Cc. $H_2O$, 10 Cc. 1 per cent. urea solution, temperature 40°, time 30 minutes.

| Seed No. | Cc. *N*/10 HCl. | Seed No. | Cc. *N*/10 HCl. |
|---|---|---|---|
| 162804 | 15.9 | 163115 | 11.4 |
| 162804 | 15.6 | 163115 | 11.1 |
| 162804 | 15.9 | 163115 | 11.3 |
| 162806 | 14.4 | 163115 | 11.3 |
| 162806 | 14.5 | | |
| 162806 | 14.4 | | |
| 162806 | 14.8 | | |

It is evident from the above that the method of preparation used is applicable for purposes of comparison, the greatest variation observed being 0.4 Cc. for different preparations of the same sample.

As might be expected, the velocity of the reaction increases with rise in temperature, as shown in the following experiment.

TABLE III.

Seed No. 162,902. 0.1 Gm. powder, 15 Cc. $H_2O$, 1 Cc. 1 per cent. urea, time, 30 minutes.

| Temperature. | Cc. *N*/10 HCl. | Temperature. | Cc. *N*/10 HCl. |
|---|---|---|---|
| 20 | 5.2 | 50 | 20.8 |
| 30 | 8.5 | 60 | 25.0 |
| 40 | 14.9 | | |

The greatest activity is at a temperature above 50° and probably below 60°. Van Slyke gives 55° as the optimum.

In comparing the activity of the different seed samples, 0.1 Gm. of the powdered sample was used in each case, 15 Cc. water and 10 Cc. of a 1 per cent. urea solution. After 30 minutes in a bath at 40°, the mixture was titrated and a blank of 0.6 Cc. deducted. In addition to germination tests, nitrogen and moisture were determined in the samples. Results are given in the following table. The samples were all of the 1918 crop, with the exception of *a* and *b*, which were grown in 1914.

TABLE IV.

| Seed No. | Variety. | Cc. *N*/10 HCl. | Germination %. | Nitrogen %. | Moisture %. |
|---|---|---|---|---|---|
| 151415 | Black Eyebrow | 20.2 | 87 | .... | .... |
| 151413 | Black Eyebrow | 19.7 | 73 | 6.35 | 6.24 |
| 151421 | Black Eyebrow | 19.1 | 80 | 7.12 | 6.01 |
| 151416 | Black Eyebrow | 19.1 | 41 | 6.44 | 6.18 |
| 151417 | Black Eyebrow | 18.6 | 70 | 7.16 | 6.36 |
| 151412 | Black Eyebrow | 18.5 | 75 | 7.49 | 6.36 |
| 163336 | Black Eyebrow | 17.1 | 61 | 7.66 | 6.39 |
| 163371 | Black Eyebrow | 17.0 | 52 | 7.67 | 6.15 |
| 163102 | Manchu | 17.0 | 92 | 6.77 | 5.99 |
| 163342 | Black Eyebrow | 16.9 | 31 | 7.47 | 6.31 |
| *a* | Mammoth Yellow | 15.6 | 2 | 7.11 | 5.97 |
| 162806 | Minn. 109 | 15.2 | 95 | 7.41 | 5.51 |
| 162801 | Minn. 109 | 15.2 | 91 | 7.30 | 6.15 |
| 162804 | Minn. 109 | 15.1 | 89 | 7.48 | 5.60 |
| 162905 | Minn. 110 | 15.0 | 75 | 7.28 | 5.96 |
| 162902 | Minn. 110 | 14.9 | 51 | 7.02 | 6.08 |
| 151418 | Black Eyebrow | 14.8 | 82 | 6.49 | 6.04 |
| 161201 | Ohio 7403 | 14.2 | 93 | 7.50 | 6.03 |
| 161119 | Ohio 9100 | 14.1 | 95 | 7.91 | 6.24 |
| 161101 | Ohio 9100 | 13.4 | 92 | 7.37 | 6.05 |
| 163115 | Manchu | 11.3 | 87 | 7.05 | 5.93 |
| *b* | Wilson | 11.1 | 23 | 6.68 | 6.23 |

From the above, it is evident that in the intact seed the urease is very stable, and as far as these observations go, its activity bears no relation to the germinating power of the seed, nor to the nitrogen or moisture content of the latter.

Fifteen varieties of soy beans, all of the 1919 crop, were then tested in the same way.

TABLE V.

| Variety. | Cc. N/10 HCl. | Germination %. | Nitrogen %. | Moisture %. |
|---|---|---|---|---|
| Columbia | 18.9 | 71 | 7.05 | 5.98 |
| Black Eyebrow | 18.9 | 73 | 7.75 | 5.54 |
| Chestnut | 17.4 | 82 | 6.30 | 6.15 |
| Mandarin | 17.4 | 51 | 7.92 | 6.26 |
| Wilson | 17.3 | 81 | 7.92 | 6.05 |
| Morse | 17.0 | 82 | 7.58 | 5.50 |
| Jet | 17.0 | 84 | 9.26 | 6.80 |
| Black Sooty | 16.8 | 80 | 7.42 | 6.30 |
| Ito San | 16.7 | 87 | 7.98 | 5.69 |
| Elton | 15.9 | 73 | 7.84 | 6.35 |
| Wisconsin Black | 15.7 | 57 | 8.26 | 6.16 |
| Ebony | 14.6 | 67 | 8.31 | 6.41 |
| Ia. 150110 | 14.1 | 80 | 7.89 | 6.11 |
| Minn. 166 | 14.1 | 51 | 7.61 | 6.12 |
| Manchu | 13.6 | 98 | 8.09 | 5.36 |

It will be seen that some difference exists in the urease activity of different varieties of soy beans, but this difference appears to bear no relation to the germinating power of the seed or to the protein content of the latter. In fact urease may be demonstrated in seeds that are practicallly dead, as in the case of sample "*a*," Table IV.

The writer is indebted tc Mr. J. H. Christ, of the Farm Crops Dept. of Iowa State College, for making the germination tests.

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## CANTHARIDES ASSAY.

By Louis Du Bois,

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The U. S. P. prior to the present IX edition, contained no standard for cantharides and no method for assay.

For years we have been using in this laboratory a method for the determination of the free cantharidin content of cantharides, which had been evolved from sources mentioned elsewhere in this article. This method has appeared to give satisfactory results both in the concordance of the results and in the apparent purity of the resulting crystals.

The report of work along this line, as given herein, is by no means final, but it has been considered advisable to publish it for the obvious reason that the U. S. P. method now official and the results from its use seem to be so unsatisfactory in our hands that we believe the matter has not been given the attention it deserves.

METHODS USED.

| U. S. P. Method. | Author's Method. | Bandin's Method. |
|---|---|---|
| 15 grams. | 10 grams. | 25 grams. |
| 150 Mils. of a mixture of 2 parts of benzene and 1 part purified petroleum benzin. | 30 Mils. $CHCl_3$. | 100 Mils. $CHCl_3$. |
| 2 Mils. HCl. | | |
| Let stand over night. | Let stand over night. | Let stand over night. |
| Gradually warm to 40° C. and keep there 3 hours, with frequent shaking. Cool and decant off 100 Mils. | Shake during several hours. | Shake 2 to 3 hours. |
| | Filter and wash with 70 Mils. $CHCl_3$. | Filter on covered filter. Collect 60 Mils. of the filtrate representing 15 grams. |
| Evaporate to about 5 Mils. | Evaporate on water bath. | Evaporate on water bath, and proceed just the same as the Author's Method. |
| Add 5 Mils. $CHCl_3$ and let evaporate in warm place. | | |
| Add 10 Mils. of a mixture of equal parts of dehydrated alcohol and purified petroleum benzin saturated with pure cantharidin, let stand 15 minutes. Decant liquid through a pellet of purified cotton and reject filtrate. | Treat residue with 5 Mils. $CS_2$. | |
| | Transfer to small tarred filter paper, 4 cm. diameter. | |
| | Wash with 10 Mils. $CS_2$ in small portions. | |
| Wash crystals with successive portions of saturated cantharidin solution, prepared as directed above, until free of coloring matter, and pour through the same pellet of cotton. | | |
| Wash cotton with small amount hot $CHCl_3$ and add washings to tarred beaker. | | |
| Evaporate solvent. | Dry filter at 60° C. | |
| Dry $^1/_2$ hour at 60° C. | Weigh. | |
| Weigh. | Add 0.010 grams for solvent action of $CS_2$. | |
| Resulting weight equals cantharidin in 10 grams of cantharidin. | This should give free cantharidin. | |
| This should give both free and combined cantharidin. | To obtain combined as well, add 2 Mils. HCl to the original chloroform. | This should give free cantharidin. To obtain combined as well, add 2 Mils. HCl to the original chloroform. |

The assays were run on two different lots of cantharides used in our manufacturing department.

*First Lot:*

| | |
|---|---|
| U. S. P. Method | 0.71% free and combined cantharidin |
| Author's Method | 1.17% free cantharidin |

*Second Lot:*

| | | |
|---|---|---|
| U. S. P. Method | (*a*) | 0.569% free and combined cantharidin |
| | (*b*) | 0.570% free and combined cantharidin |
| Author's Method | (*a*) | 0.795% free cantharidin |
| | (*b*) | 0.810% free cantharidin |
| Baudin's Method | (*a*) | 0.789% free cantharidin |
| | (*b*) | 0.753% free cantharidin |
| Author's Method Modified | (*a*) | 1.73% free and combined cantharidin |
| | (*b*) | 1.77% free and combined cantharidin |

The method pursued in this laboratory is the one given here under the heading "Author's Method." It is the assay method of Baudin as given in Hager's "Handbuch der Pharmaceutischen Praxis," Vol. 1, page 595, and in Sadtler and Coblentz's "Pharmaceutical and Medical Chemistry," Vol. 2, page 226, modified only so as to make it a complete extraction method, instead of an aliquot portion method. We have nothing now to suggest as to the relative value of these two well-known chemical procedures except to express a preference for total extraction methods. This does not seem to agree with the trend of development of the U. S. P. text.

A glance at the U. S. P. will leave no doubt that the cantharides assay is a very troublesome and difficult procedure. Note the digestion, maintained at 40° C. for three hours with frequent shaking. Note the evaporation to about 5 Mils. and the addition of chloroform to promote crystallization. Note the curious mixtures of solvents used—benzene and benzin, dehydrated alcohol and benzin.

However, the chief objection that we have found with the U. S. P. assay method is not the number of manipulations and varieties of solvents involved, but that we have been obtaining lower results for both "combined and free" cantharidin, by this method than we obtain for "free" cantharidin alone by either the Author's or the original Baudin Method; and that the resulting crystals are not as satisfactory as those obtained by the latter two methods. The crystals obtained by both the Author's Method and Baudin's Method for free cantharidin are clean, white and well formed. Those we have obtained with the U. S. P. assay method have been dark and resinous.

We have also run assays for total cantharidin (both free and combined) by modifying both the Author's Method and the method of Baudin, by the addition of 2 per cent. of hydrochloric acid to the first solvent. The results by these methods are still higher, but the crystals obtained are not as satisfactory as those by the methods for free cantharidin alone—the resulting crystals not being as pure and free from resinous matter.

The U. S. P. makes no reference to the presence of both free and combined cantharidin in cantharides; but the assay given is for both the free and combined, hydrochloric acid being added to liberate the alkali-combined cantharidin.

We have never seen any published statement as to whether the combined cantharidin has any blistering effect when applied to the skin, but have assumed heretofore that the blistering effect is due to free cantharidin alone, when the powdered cantharides is used as an ingredient of a blistering plaster. It would seem that this also is believed to be true in the case of the official tincture where no attempt is made to liberate the combined cantharidin before making the alcoholic extraction. On the other hand, acetic acid has been incorporated in the formulas of the other two official cantharides preparations, Ceratum Cantharidis and Collodium Cantharidatum.

RESEARCH LABORATORY,
JOHNSON & JOHNSON,
NEW BRUNSWICK, NEW JERSEY.

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## PEPSIN ADSORPTION BY CHARCOAL.

BY NORMAN D. KEEFER, P.D.,

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Adsorption, as a phenomenon, has been practiced for centuries, but it has only been for the last quarter century that it has been understood. Adsorption is a condition of distribution, wherein the surface rather than the dispersed phase plays the important rôle. We know that bone black is used to bleach dark sugar juices, extract fusel oil from alcohol, and decolorize dark solutions of the organic chemist. And now we are to learn that any substance which causes a marked diminution of surface tension of water, such as fats, soaps, albumin, etc., are very readily absorbed.

Since powdered charcoal is a very good adsorbent, we will start our attack upon it and its common accomplice, in the medical profession. Charcoal and pepsin is a very frequent combination dispensed by prescriptionists, as well as put up in tablet and capsule form by wholesalers. While it is advised therapeutically that pepsin be given alone and not in combinations for fear of its chemical incompatibility; in this instance no chemical reaction occurs, but an adsorption of pepsin by the charcoal as soon as the two substances are moistened.

To prove this adsorption, two samples of pepsin, a powdered and a granular grade, were first tested by the U. S. P. method of assay and found to be of 1 : 3000 strength or U. S. P. As our present day pepsin is an enzyme in combination with albumin (mostly albumin) it will readily give an albumin test, when the top layer of an acid solution is heated in a test tube over a flame. (Same as heat test for albumin in urine.) By filtering this acid solution, which is of pepsin and acid strength according to U. S. P. assay, through charcoal, the filtrate will be free from albumin. This charcoal-filtered solution was tested on freshly-coagulated albumin according to U. S. P. assay and found to assay 1 : 300. This value, I believe, could be lowered considerably, by better filtration as only ordinary filter paper was used.

Next a group of tests were made with 0.5 Gm. of charcoal in 100 Mils. of the U. S. P. test solution. This charcoal-containing solution assayed to about 1 : 500 as near as could be estimated; the charcoal making the end reaction indistinct. This group of tests was made to ascertain what action might be expected to occur in the stomach, when about the same proportions of each drug are dispensed in tablet form.

Since this adsorption by charcoal is a very rapid process, it can be readily seen that pepsin-charcoal combinations, in tablet or capsule form, will as soon as moistened (in the process of dissolving) begin the adsorption reaction. An easy example of this can be shown by dissolving a few charcoal and pepsin tablets in 0.2 per cent. hydrochloric acid, filtering the solution, and testing filtrate for albumin; this will prove the albuminous enzyme is absent.

From these experiments and deductions it can be readily seen that all our former therapeutics concerning these two drugs, when used together, has been at fault.

While on this subject of adsorption, it might be well to state some

of the more recent uses of charcoal as an adsorbent. Charcoal was used very extensively in the war as an adsorbent in the gas-mask. It was also used in the treatment of severe enteric infections such as cholera, dysentery, and typhoid. The results were very gratifying, for it not only acts as an adsorbent of toxins produced by the infectious agent, but by adsorbing the bacteria themselves. Charcoal in large doses has yielded good results in hyperchlorhydria and fermentation. Lichtwitz overcomes obesity by administering charcoal in such amounts to satisfy the pangs of hunger, and at the same time it removes the acids and enzymes from the system, and diets the patient. Sterile charcoal has been used in purulent and dissection wounds as well as in exuberant carcinomata.

A good effect was obtained by administering charcoal impregnated with iodine and thymol in the treatment of typhoid. A preparation of charcoal impregnated with sulphur is used as a mild laxative, which at the same time relieves flatulence by adsorption of putrefactive material and bacteria.

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## A MODIFIED FORMULA FOR MAGMA MAGNESIA.

By Bertha Mueller,

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At the present time, pharmacists are being invited to give helpful suggestions for the coming pharmacopoeia, in order to make the book even more successful than its predecessors have been. It might be pertinent, therefore, to point out that one of the greatest factors contributing toward such success must perforce be simplicity in technic of working-formulas.

The manufacture of pharmaceutical preparations constitutes a most interesting piece of work, and it cannot be reiterated too often that pharmacists ought to do as much of their own manufacturing as possible, if for no other reason than that of pleasant diversion from dull routine. And pharmacists, no doubt, would do more of their own manufacturing if it did not in many instances involve an undue amount of time and labor to make a comparatively simple preparation. Hence, it has ever been the ambition of the writer to try to simplify the technic in complicated working-formulas wherever it

seemed possible to do so without harmful effect on the finished product.

This has again led to some work on Magma Magnesia. This preparation promises to become ever more popular as time goes on, and it must be conceded that neither of the two formulas that have been made official are entirely satisfactory because they involve too great an expenditure of time, money, and labor. It is not the writer's object to go further into detail on this point than to draw attention to the fact that the one great drawback in these formulas is the washing process. It is costly and time-consuming.

A pharmacist must either prepare the water for washing the magma or he must use distilled water. The former involves time and labor; the latter expense. Since pharmacists usually buy their distilled water, they would hardly feel that it pays them to use it in such immense quantities as are required for the washing of this preparation. A formula, therefore, that does away with this washing process should prove of considerable value. Such a formula was advanced some years ago by F. C. Weber, who, according to the *Proc. of the P. P. A.*, for 1915, mentions Calcined Magnesia as yielding a satisfactory magma, and gives formula and directions for preparing the same.

Light Magnesium Oxide U. S. P. is without doubt a most satisfactory chemical for this purpose. It yields a magma which stands up splendidly, does not cake on long standing, pours easily, is beautifully smooth and white and is free from disagreeable taste. It must be remembered, however, that in order to have good results the chemical must be of U. S. P. standard.

The simplified formula advanced was tried out by us at the time; but it was not wholly satisfactory because of the property possessed by light magnesium oxide to gelatinize when mixed with water *per se*. This is a disadvantage, as the solidified mass thus formed is not easily broken up into a smooth magma. In order to overcome this undesirable feature, experiments were carried on with water containing a small percentage of some chemical. Various chemicals were tried out in that way. Ultimately it was found that lime water U. S. P. was the best solution for the purpose, as it prevents gelatinization and in its stead brings about a gradual thickening of the mixture.

The following formula has been used by us for some time and has always given satisfactory results:

| | |
|---|---|
| Light Magnesium Oxide, U. S. P..... | 60.00 |
| Lime Water, U. S. P. to make..... | 1000.00 |

Gradually and with constant stirring add the light magnesium oxide to about 800 Mils. of lime water contained in a graduate or a graduated wide mouthed jar. Mix thoroughly and bring up to 1000 Mils. with lime water, then pour into a bottle of the capacity of about two liters. Stopper the bottle and shake vigorously, at frequent intervals, until the mixture has thickened properly.

It has been our experience that vigorous shaking at frequent intervals hastens thickening of the magma. This is especially true if a bottle is used that holds considerably more than the amount of magma to be manufactured. If these requirements are carried out a splendid magma can be prepared within three days' time. It does seem strange, but it is a fact that rubbing the magma up in a mortar does not hasten its thickening nor is the finished product in any way superior to the one prepared according to above directions.

Another thing that might prove of interest is the corking of magma magnesia. It is common knowledge that ordinary corks are quickly acted upon by the alkaline mixture, causing them to turn dark, with the result that the magma is stained dark where it comes in contact with the cork. This unsightly appearance in the neck of the bottle can be avoided if the cork is given a protective coating of paraffine previous to its use. A cork thus protected can be used for months without causing the slightest discoloration.

It may be stated that though this chemical is much more expensive than magnesium sulphate, the quantity required for one liter of the preparation does not cost more than the sum total of the chemicals that enter into the same amount of magma prepared according to either of the formulas that have been officially recognized. This striking fact was brought out by an estimate made according to a price list for February, 1920, issued by a large chemical manufacturing firm. According to this price list, the cost of the chemicals for one liter of magma magnesia, U. S. P. formula, amounts to from twelve and one-half to thirteen cents. The cost of the chemicals according to the N. F. formula amounts to about fifteen cents, and that of the formula given above to about twelve and one-half cents. From this it can readily be seen that the distilled water required for washing the magma comes very much higher than the chemicals do.

# SUGGESTIONS FOR THE REVISION OF THE NATIONAL FORMULARY, FOURTH EDITION.

By George E. Ewe,

PHILADELPHIA, PA.

We are approaching the regular period for a revision of the National Formulary, and therefore suggestions for revision are pertinent at this time.

The present edition has rendered almost perfectly satisfactory service as a standard for the quality of the materials used in the compounding of medicinal preparations, which enjoy common usage, and as a standard for the methods of compounding and standardizing these preparations. So satisfactory has been that service, that it is with hesitation that I take up the task of presenting a few criticisms of the present edition, and also some suggestions for improvements for consideration in connection with the coming revision.

Absolutely no important defect in the present edition has presented itself to the writer. The suggestions made in this paper relate chiefly to minor improvements which may be of assistance in permitting the next edition to render even more satisfactory service than the present one.

## ADMISSIONS.

Upon the matter of admissions, very much can be said. Suggestions from individuals for admission of specific preparations and substances, in the absence of a general concurrent opinion, necessarily carry but little weight. A broad scientific method of accurately ascertaining the need of admitting items is urgently required.

The following plan is herewith submitted with the belief that if put into operation more accurate information regarding appropriate admissions into the N. F. will be ascertained than is possible through suggestions by individuals or organizations of limited scope:

*In the Case of Chemicals: Data for basing decision for admission.*—Lists of *purchases* of chemicals by the large and more representative drug trade jobbers and pharmaceutical manufacturers should be obtained. The output of chemical manufacturers should not be included unless the manufacturer supplies only medicinal chemicals or unless the manufacturer presents a list showing only his output of medicinal chemicals.

The lists should include all N. F. and all important and widely demanded chemicals, and *must be kept strictly confidential by the Revision Committee.* Purchases by jobbers and pharmaceutical manufacturers are suggested because these records are readily available, whereas *output* could not be obtained because of the diversions of a lot of chemicals to innumerable uses. A period of not less than two years should be considered as a basis for collection of data, as this is required to obtain an average.

Basis of decision: The items on the individual lists should be placed in classes based upon their dosage. Where output or purchase of non-official chemicals is greater than the output of N. F. chemicals of the same general dosage, the non-official chemicals should be placed in a class to be considered for admission to the N. F. Then the results of classification of all of the individual lists should be harmonized and chemicals thus selected should be seriously considered for admission to the N. F.

*In the Case of Crude Drugs: Data for basing decision for admission.*—Lists of purchases of crude drugs by larger drug trade jobbers and pharmaceutical manufacturers should be obtained. The output of a collecting house should not be considered unless the output is solely for medicinal purposes or the list specifies only the part of the output which was diverted to medicinal purposes. The lists should include all N. F. and all important and widely demanded crude drugs and *must be considered strictly confidential by the Revision Committee. Purchases* by jobbers and pharmaceutical manufacturers are suggested for the same reasons as mentioned under "chemicals" above. A period of not less than two years should be considered as a basis for collection of data, in order to obtain an average, because some supplies of crude drugs are purchased quite infrequently.

Basis of decision: As mentioned above, under "chemicals."

*In the Case of Pharmaceutical Products: Data for basing decision for admission.*—Lists of *purchases* by jobbers and *output* of manufacturers. The lists should include all N. F. and all important and widely demanded products, and *must be considered strictly confidential* by the Revision Committee. *Purchases* by jobbers and *output* of manufacturers are suggested, because these records are readily available. A period of not less than two years is desired for the collection of data, because the number of lots of any one preparation made up during one year is too small for average purposes.

Basis of decision for admission: Same as above under "chemicals."

In choosing the manufacturers and jobbers for coöperation in this plan, efforts should be made to have all sections of the United States and its possessions represented.

This plan is dependent entirely upon the acquisition of the cooperation of drug manufacturers, collectors, and jobbers.

Coöperation may possibly be obtained from many manufacturers, collectors, and jobbers upon formal request. Information offered must necessarily be considered *strictly confidential* and public acknowledgment of the assistance rendered should be made by the *Revision Committee.*

### DELETIONS.

A broad scientific plan of ascertaining the advisability of deleting items from the N. F. is also urgently needed. Such a plan would result from the adoption of the above-mentioned plan for ascertaining the need for admitting items, as those N. F. items enjoying only small output by manufacturers and small purchases by jobbers, in comparison with the items being heavily manufactured and purchased, would naturally become candidates for deletion.

### METHOD OF KEEPING THE N. F. WITHIN EASILY HANDABLE SIZE.

The less potent, less important, and less commonly used substances could be continued in the following edition, merely by name and by referring to the previous edition for descriptions of the methods and tests. Any required additional tests, or modifications of previous tests could be included under the name in the following edition and any deletions of previous tests could also be recorded there.

### CHEMICALS.

*Manganese Glycerophosphate Soluble.*—This product consists of a mixture of 70 parts of Manganese Glycerophosphate and 30 parts of citric acid. Manufacturers of Manganese Glycerophosphate object to mixing their product with citric acid, therefore this product is not generally available. A formula for its manufacture should be included in the N. F. and the present monograph for this product should be adapted to plain Manganese Glycerophosphate, which also should be admitted to the N. F.

*Quinine Formate.*—The use of this substance is rapidly increasing and standards should be established for purposes of uniformity.

The majority of quinine formate on the market contains water of crystallization equivalent to about 5 per cent. of its weight. The melting intervals vary greatly. The quinine content is perfectly satisfactory, as all samples assay 100 per cent. or slightly over, of anhydrous quinine formate when the salt is dried at 100° C. and assayed for quinine alkaloid.

The following results were obtained on 6 lots examined during the past two years:

| Sample No. | Loss at 100° C. | Melting Interval. |
|---|---|---|
| 1 | ..... | 120–122° C. (Not dried) |
| 2 | ..... | 124–126° C. (Not dried) |
| 3 | ..... | 145–150° C. (Not dried) |
| 4 | 5.32% | 169–171° C. (Dried) |
| 5 | 5.00% | 155–156° C. (Dried) |
| 6 | 4.20 | 153–154° C. (Dried) |

CRUDE DRUGS FOR WHICH NO PRACTICAL CHEMICAL OR PHYSIOLOGIC METHODS OF STANDARDIZATION ARE AVAILABLE.

Standards based upon the amount of soluble matter, extracted by the menstrum used in preparing fluid extract or tincture from the drug, should be adopted in order to establish uniformity in the use of these naturally variable medicinal substances. Limits which will include all natural variations should be established and an average adopted upon which the proportionate use of the drug must be based. These standards constitute the familiar "extractive standards" and no difficulty should be experienced by the Revision Committee in obtaining satisfactory data for the establishment of these standards, from the scientific laboratories of pharmaceutical manufacturing companies, who exercise scientific control of manufacture and also from other scientific sources.

EXTRACTS.

*Extract Euonymus.*—Very little of this extract is used and deletion is suggested, or continuance in the next edition by name only with reference to the present edition.

*Extract Hematoxylon.*—The remarks under Extract Euonymus also apply to this Extract.

*Extract Jalap.*—An assay process and standard might be included in the next edition for this product, for the purpose of establishing uniformity in market supplies.

The following process based upon the U. S. P. assay process for Jalap has yielded excellent results:

Assay for total resins: Sample about 2.5 Gms., accurately weighed. Place the sample in an Erlenmeyer flask; add 75 Mils. of 95 per cent. alcohol and heat on steam bath for four hours, using a funnel in the neck of the flask as reflux condenser. Wash into a 100 mil. volumetric flask, cool, dilute to 100 Mils. with 95 per cent. alcohol, mix well, filter and place 20 Mils. of the filtrate (equivalent to $^1/_5$ of the sample originally weighed out) into a separator and finish like Jalap U. S. P.

Standard: Years of experience has shown that 28 per cent. total resins is a perfectly satisfactory standard, is practically attainable, and the trade is familiar with the therapeutic strength of an extract containing this percentage of total resins.

*Extract Podophyllum.*—Standardization of this extract is to be desired in order to establish uniformity in market supplies.

The following method has yielded satisfactory results for purposes of standardization, but it does not yield total results as explained below:

Sample about 2 Gms., accurately weighed. Boil in 20 Mils. of alcohol until dissolved. Filter, if necessary. Evaporate the filtrate in a 200 Mils. beaker to the consistency of a thin syrup. Pour 10 Mils. of ice water, containing 0.1 Mil. of concentrated hydrochloric acid into the thin syrupy concentrate and stir until all the lumps of resin disintegrate. Immediately filter off the precipitated resin while still ice cold on a counterpoised filter using *suction*, and wash the beaker, resin and filter with not more than 25 Mils. of ice water. Dry the filter and resin on a watch glass at 100° C. to constant weight.

This assay process is exactly similar to the U. S. P. assay method for podophyllum, with the exception that it is arranged for analytical procedure instead of for manufacturing procedure, and the resin is finally dried at 100° C. instead of being allowed to dry spontaneously. The spontaneous drying of this resin is a tedious and needless process, since air-dried podophyllin contains only around 4 per cent. of moisture as a rule. I have ascertained this by determining the moisture in many commercial lots of U. S. P. resin podophyllin, and have also determined it by permitting resin podophyllin obtained upon assay of this extract to dry spontaneously and then running a moisture determination on it.

This resin precipitation method is not all that could be desired since it consists of the precipitation of a partially water-soluble resin by water, and therefore the results are low. A much more accurate and consistent method is the "shake out" method proposed for Fluid Extract Podophyllum by W. M. Jenkins in *The Journal of Industrial and Engineering Chemistry*, p. 671, 1914. This "shake out" method gives higher results than the precipitation method, because total results are obtained and the resultant resin answers all U. S. P. requirements for Resin Podophyllin.

A perfectly satisfactory standard is: 17 per cent. resin. This standard is based upon practical attainment, and the trade is familiar with an extract of this strength.

## FLUID EXTRACTS.

### FLUID EXTRACTS FOR WHICH NO PRACTICAL CHEMICAL OR PHYSIOLOGIC METHODS OF STANDARDIZATION ARE AVAILABLE.

Standards based upon the average amount of soluble matter extracted from the drug by the menstruum should be adopted in order to establish uniformity in market supplies. These standards constitute the familiar "extractive standards," and no difficulty should be experienced by the Revision Committee in obtaining satisfactory data for the establishment of these standards, from the laboratories of pharmaceutical manufacturing companies who practice scientific control of manufacture and also from other scientific sources.

*Extract Chirata.*—There is practically no demand for this product and deletion is suggested or continuance in the next edition by name only and reference to the present edition.

*Fluid Extract Conium.*—The substitution of sulphuric acid for the acetic acid of the present formula and direct percolation to yield, is to be recommended.

The use of $2^3/_4$ per cent. of a 10 per cent. solution of sulphuric acid has been found superior, in practice, to the acetic acid now prescribed, as the sulphuric acid is not volatile and holds the alkaloid in solution more efficiently. Slow, careful, direct percolation to yield gives practical exhaustion when acetic acid is used, as any alkaloid extracted by extra percolation will be largely lost when the extra percolate is concentrated in preparation for its addition to the bulk of the percolate.

When sulphuric acid is employed, extra percolation may be

productive of benefit, but even then it is usually more practical to merely obtain the yield of fluid extract by slow, careful, direct percolation to yield.

*Fluid Extract Cubeb.*—An assay based on the U. S. P. process for the determination of "volatile extractive, soluble in ether," in the crude drug, might be included in the next edition, in order to establish uniformity in the market supplies of this fluid extract. The following method has yielded excellent results for purposes of standardization:

Sample 10 Mils. Place on 10 Gms. of oak sawdust contained in a 6-inch evaporating dish. Mix well and allow to dry spontaneously for exactly six hours at room temperature, stirring occasionally. Place impregnated sawdust in a bottle. Add 100 Mils. of ether, which has been previously dried over anhydrous calcium chloride. Shake the bottle and contents for four hours. Filter off a 50 Mils. aliquot and place it in a 250 Mils. beaker, allowing the ether to evaporate spontaneously, and as soon as all the ether is off, place the beaker in a sulphuric acid desiccator and allow it to remain there for exactly 18 hours. Weigh. Then place the beaker in an oven at 110° C. until the weight is constant. The loss in weight during the heating represents "volatile extractive, soluble in ether."

A standard of not less than 8 Gms. of "volatile extractive, soluble in ether" per 100 Mils. of fluid extract would answer all standardization purposes.

The standard for crude drug is 10 per cent., but it is not practical to completely exhaust the drug.

*Fluid Extract Jalap.*—An assay process and standard for total resins might be included in the next edition in order to establish uniformity in market supplies of this product.

The following assay process, based upon the U. S. P. assay process for Jalap drug, has rendered excellent service:

Sample 10 Mils. Dilute with alcohol to 100 Mils. Place 20 Mils. of this dilution (corresponding to 2 Mils. of fluid extract) in a separator and proceed as in the assay of Jalap U. S. P.

As tandard of 7 Gms. total resins per 100 Mils. can be recommended as being commercially obtainable, and representing the drug, Gm. per Mil.; the U. S. P. standard for the drug being 7 per cent. total resins.

*Fluid Extract Kola.*—Standardization is to be recommended for this product, so as to establish uniformity in market supplies.

The assay method for caffeine in Fluid Extract Guarana U. S. P. is also applicable to the assay of this fluid extract.

A standard of 0.9–1.1 Gms. caffeine per 100 Mils. is satisfactory, because it is based upon practical attainment and is familiar to the trade.

*Fluid Extracts Matico, Mezerium and Quercus.*—Deletion of these fluid extracts is suggested. The remarks under Fluid Extract Chirata also apply to these fluid extracts.

*Fluid Extract Sanguinaria.*—Standardization is to be recommended in order to establish uniformity in market supplies.

The following assay process has rendered excellent service for purposes of standardization:

Place exactly 5 Mils. of Fluid Extract Sanguinaria on 10 Gms. of oak sawdust. Allow to dry spontaneously in a warm place. Place the impregnated sawdust in a bottle. Add 100 Mils. of ether and 10 Mils. of 10 per cent. ammonia water. Shake the bottle and contents for four hours. Filter off an aliquot. Shake out with 1 per cent. sulphuric aid. Make acid extractions alkaline with 10 per cent. ammonia water and extract with ether. Evaporate ether extractions, dry residue at 80° C. and weigh as alkaloids.

Standard: 2.5 Gms. alkaloids per 100 Mils.

This standard is based on practical attainment, and the trade is perfectly familiar with fluid extract of this strength.

The assay process described above is the typical "immiscible solvent gravimetric alkaloidal assay" process. The only specific feature is the use of 1 per cent. sulphuric acid solution for extraction; weaker acid may be used, but 2 per cent. acid results in precipitation of alkaloidal sulphate which greatly interferes with drawing the acid extractions off from the separator.

## SYRUPS.

*Syrup Iodotannin.*—An assay for iodine is desirable, because it is necessary to use heat in the preparation of this syrup, while the iodine is still in a free condition. A standard for iodine content will insure uniformity in market supplies of this syrup.

A satisfactory method of assay, which consists essentially of a modification of direct titration of iodides by $N/10$ silver nitrate and potassium sulphocyanide, is outlined in my "Laboratory Notes," on page 175 of the 1919 *Proceedings of the Annual Meeting of the Pennsylvania Pharmaceutical Association.*

## TINCTURES.

### TINCTURES FOR WHICH NO PRACTICAL CHEMICAL OR PHYSIOLOGIC METHODS OF STANDARDIZATION ARE AVAILABLE.

The remarks above under "fluid extracts for which no practical chemical or physiologic methods of standardization are available" also apply to these tinctures.

*Alcohol Percentages of N. F. Preparations.*—A list of alcohol percentages of N. F. preparations is desirable as being of assistance in preventing incompatibilities in manufacturing preparations and in compounding prescriptions.

The Revision Committee should experience no difficulty in obtaining satisfactory data for the establishment of these standards from the laboratories of pharmaceutical manufacturing companies which exercise scientific control of manufacture and also from other scientific sources.

## TEST FOR HEAVY METALS.

The N. F., 4th edition, test for heavy metals makes no provision for those heavy metals beyond the lead and arsenic groups, principally zinc. The following modification is suggested:

Between the phrases "and again set aside for half an hour" and "The color produced, if any, etc.", add "evaporate to dryness. Redissolve residue in 1 Mil. of diluted hydrochloric acid, dilute with 10 Mils. of water, filter, make the filtrate alkaline with ammonia water, boil until nearly free from ammonia, filter, wash filter with enough distilled water to obtain 10 Mils. of filtrate, add 1 Mil. of ammonia water followed by distilled water q. s. 20 Mils. and saturate with $H_2S$ gas." Add the phrase "either by the hydrogen sulphide T. S. or the $H_2S$ gas," after "The color produced."

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# THE MANNA OF SCRIPTURE.*

By E. M. Holmes, F.L.S.

The recent discussion in *The Chemist and Druggist* concerning the nature and origin of the manna of the Israelites has led me to venture to express the opinion of a botanist on the subject, for to a student of that science, especially to an economic botanist, the subject presents an exceedingly interesting problem.

The description given by the Jewish historian in the Pentateuch does not exactly fit in with any known vegetable production, and the various plants or plant products with which manna has been doubtfully identified from time to time cannot reasonably be considered by any botanist to meet the requirements of the case.

The plant that has most generally been accepted as being the manna of Scripture is a lichen, *Lecanora esculenta*, var. *mannifera*, Ehrenb., which is abundant on stones and rocks, and in certain stages of its growth is broken up by drought and violent winds into small particles, which collect in quantity under the lee of small bushes which arrest its career, or is carried away by rainstorms and deposited in wave-like furrows in sandy desert ground in considerable quantities. An illustration of this plant is given in Kerner and Oliver's "Natural History of Plants," Vol. I, p. 195, and a description of its curious growth and distribution in Vol. II, pp. 810, 811. Two other species are mentioned as being found mixed with it—*viz.*, *Lecanora desertorum and Lecanora Jussufii.*

*Lecanora esculenta* is abundant from Persia and Asia Minor to Algeria and the Sahara in North Africa. But this lichen differs from manna in not appearing with the dew, not breeding worms and not stinking if kept for two days. I have had a specimen of it in my possession for over thirty years, and it is as hard and solid as when it first came into my possession. It is obvious, therefore, that it cannot be the manna of Scripture, as it does not possess any of its characters. It may be useful to quote here the actual descriptions given in the Pentateuch of the appearance of manna. The best account of it occurs in Exodus xvi, 14–36, which reads thus: "And when the dew was gone up, behold, upon the face of the wilderness a small round (or flake), small as the hoar frost upon the ground. . . . . " Moses said, "Gather ye of it every man accord-

* *The Chemist and Druggist*, January 3, 1920.

ing to his eatings;" and added, "Let no man leave of it till the morning." But some of them left it till the morning, and it bred worms and stank. When the sun waxed hot it melted. . . . "And the house of Israel called the name thereof 'Manna:' and it was like coriander seed, white; and the taste of it was like wafers made with honey."

The description given of it in Numbers xi, 7–9, is slightly different:

"The manna was like coriander seed and the eye thereof as the appearance of bdellium. The people went about and gathered it and ground it in mills or beat it in mortars and seethed it in pots and made cakes of it, and the taste thereof was as the taste of fresh oil. And when the dew fell upon the camp in the night the manna fell upon it."

It is obvious to any cryptogamic botanist that these characters belong to fungi rather than to lichens. Everyone familiar with British fungi knows how rapidly, even in our own temperate climate, many of the softer agarics become full of the grubs or larvae, of small flies or beetles, and how rapidly fungi grow when the conditions of warmth and moisture are suitable for their development. Melting in the sun (or as soon as the spores are mature) is a familiar phenomenon in our country in the case, for instance, of *Coprinus atramentarius*, which derives its specific name from the fact that the plant deliquesces into a black, inky fluid. The same genus also provides the edible species, *Coprinus comatus*. To mycologists, also, the gregarious character of many fungi is well known. I remember, some years ago, noticing on Saunton Sands, in North Devon, that apparently the ground was scattered all over in one place with what looked like bleached rabbit's dung, each nodule of which had a dark point in its centre, on stooping to take up one nodule to ascertain the cause of this appearance, it came up in my hand with a stalk of about six times its length, which had been immersed in the sand, and it proved to be the rare fungus *Tulostoma mammosum*. This may have some bearing on the statement that the eye or "appearance of manna was as the appearance of bdellium" (Numbers xi, 7), which may have indicated that the manna grains had a dark central spot.

The other substances which have been suggested as being the manna of Scripture are described in "Pharmacographia" (2nd ed.), pp. 414–416, and in Smith's "Dictionary of the Bible," 1865, p. 512; but these cannot possibly be regarded as answering to the

biblical description, since they are saccharine exudations from bushes or small trees, used when cleaned, like honey, to sweeten farinaceous cakes, but never made into cakes by themselves. Thus, although the tamarix manna, from *Tamarix Gallica*, var. *mannifera*, Ehrenb., is found in June, July and August, caused by the puncture of an insect, *Coccus manniparus*, Ehrenb., occurs in the peninsula of Sinai; the name manna (meaning, What is it?) would hardly have been applied to it by the Israelites when they could see its source. Indeed, the Arabs call it *Gazangabin*, meaning tamarisk honey, not manna. Moreover, these saccharine exudations do not breed worms and stink in two days, for specimens of them in the Hanbury Collection of Materia Medica, at 17 Bloomsbury Square have remained there unchanged for nearly forty years. When, therefore, soon after the publication of Mr. A. T. Swann's book on "Fighting the Slave-driver in Central Africa" appeared, I read his account of the manna that he saw on the plateau between the lakes Tanganyika and Nyasa, I recognized at once that the description he gives of it agrees almost word for word with the biblical account of manna, and I therefore wrote and asked Mr. Swann if he could, through any friends there, or travelers going to that region, obtain for me some of the plant, preserved in spirit or solution of corrosive sublimate, which presumably most medical missionaries take with them. In reply, he kindly promised to take the first opportunity that occurred to endeavor to get a specimen, but whether the opportunity never occurred or the promise slipped from his memory, I was unable to ascertain, since shortly afterwards I lost the memorandum of the name of the book and the author's name and address, and although I searched through a number of books on African travels I could not find the passage again until I saw a reference to it in the *C. & D.* in "Xrayser II's" note on manna a week or two ago, and now I cherish the hope that before my days are ended, I may yet be able to solve this riddle of the ages, or to see it solved by some other cryptogamic botanist; for I feel convinced that manna is a fungus hitherto undescribed and belonging possibly to a new genus. At all events, I intend to hang on to the trail I had lost until the enigma is solved. It may be interesting to quote here Mr. Swann's description of manna, word for word, for comparison with the biblical description already quoted (*loc. cit.*, p. 116):

"It was whilst passing through this district (the high plateau which separates the lakes Tanganyika and Nyasa), composed mostly

of sand stone and granite, and occupied by the Amambwi tribe, that I was shown a very curious white substance very similar to porridge. It was found early in the morning before the sun rose. On examination it was found to possess all the characteristics of the manna which is said to have fallen for the benefit of the Israelites. In appearance it resembled coriander seed, was white in color, like hoar frost, sweet to the taste, melted in the sun, and if kept overnight was full of worms in the morning. The natives were not allowed to gather it without asking permission from the chief. It required to be baked if you intended to keep it any length of time. This substance was seen some years afterwards in the same district by several Europeans now living (1910), who can vouch for the accuracy of my description of this food. When asked what it was and where it came from the natives replied, 'It's the food of God. No one knows where it comes from.' I have never seen or heard of it in any other part of the world, although it may be known to others. A cake of it was baked and sent to England, but no one appeared able to determine its identity. It looked as if it was deposited on the ground in the night, but in what manner I was never able to ascertain. No holes could be found in the ground near it or one might have concluded that insects unearthed it during the night. The only suggestion I could think of was that it might be a mushroom spawn, as on the spot where it melted tiny fungi sprung up the next night."

During the last few days I have had the privilege of conversing with a medical missionary, Dr. Wareham, who knows the district well where African manna was found; and he and Mrs. Wareham confirmed the statements made by Mr. Swann, but stated that they had only once seen the manna during eighteen years' residence in Africa. He has promised to endeavor to get some of the living manna preserved in spirit or formaldehyde or solution of corrosive sublimate, and to get some of the soil in which it grows sent separately in a small box. Mrs. Wareham suggested that possibly ants might have something to do with its appearance in such profusion. It is well known that in this country ants cultivate certain fungi in their nests, apparently for food when it is scarce outside.

The miracle respecting manna was undoubtedly its phenomenal production on an enormous scale in the immediate neighborhood of the Israelitish camp. In this respect it resembles other miracles related in Scripture, such as the multitude of fishes, the feeding of

the five thousand; but that the manna itself was a vegetable product, possibly of rare occurrence but miraculously increased in quantity, just as the quails were in this case driven by a particular wind, seems probable. That a plant occurring in Central Africa should also occur in Arabia is not at all improbable, since we know that plants often extend great distances along river basins, or occur on mountains at immense distances apart when the conditions are similar, although the plant may present slight variations, as in the Guide's Flower (*Leontopodium alpinum*), which occurs from Mont Blanc in the Swiss Alps to the Himalayas.

It is a remarkable fact that a deep valley runs for nearly 4000 miles from Arabia to the Cape of Good Hope, known as the Great Rift Valley, and along its sides there occur several forms of a plant of the genus *Acokanthera*, Nat. Ord. *Apocynaceoe*, from one end of the valley to the other; *Acokanthera Deflersii* in Arabia, *A. Schimperi* in Northeast and Central Africa, and *A. spectabilis* and *A. venenata* in South Africa. It need not be surprising, therefore, if a cryptogamic plant like manna were found along the sides of this immense valley, extending from the Lebanons almost to the Cape of Good Hope, wherever the conditions were suitable for its development, since the spores of fungi are easily carried on the feet of birds. There is, therefore, apparently no reason why the manna of Tanganyika should not be identical with that of Arabia. Gregory, in "The Great Rift Valley" (p. 5), states that a series of thirty lakes occur along its course, only one of which communicates with the sea, thus indicating that it was an ancient river bed, and giving some support to the theory that this was the bed of the ancient river Gihon (Genesis ii, 13), which "compasseth the whole land of Cush." The land of Cush, according to Smith's "Dictionary of the Bible" (1865, p. 223), evidently included both Arabia and the country south of the western coast of the Red Sea.

According to Gregory ("The Great Rift Valley," p. 51), the Arabs told him that the Red Sea is simply water that did not dry up after Noah's deluge; and the Somali say that when their ancestors crossed from Arabia to Africa there was a land communication between the two across the Straits of Babel Mendeb. There is geological evidence to show that great earth movements have happened along the Great Rift Valley at a recent geological date. There seems to be nothing improbable, therefore, in the possible occurrence of the scriptural manna plant in Central Africa as well as in Arabia.

But there are one or two features in the biblical description of manna that call for comment. One is the reason why it kept over the Sabbath without becoming filled with worms and stinking. The directions given to bake or seethe it would naturally kill all insect life in it; and the manna, that was to be preserved for generations as evidence of the Israelites being miraculously fed, was probably baked, and may have become hard or horny in the process. It is not easy to explain otherwise why they "ground it in mills or beat it in mortars," especially as in the fresh state it was soft enough to melt in the sun's heat. The text is difficult to follow, but in Numbers xi, 8, it seems to imply that, after grinding it, it was seethed and made into cakes.

The fact that the manna was abundant enough to feed a multitude of people for forty years indicates that by some unrecognized means the plant miraculously increased, and the conditions were those of uncultivated land, since it ceased when they "came to land inhabitated," "in the borders of the land of Canaan."

Another point is the continuous production of the plant for forty years and all the year around. But we have the evidence at home that the mushroom, which in the wild state is usually confined to August and September, can be produced all the year round if the natural conditions of heat, moisture and food are artificially provided. There may have been conditions connected with the manner of life of the people which produced artificially the requirements of the plant. At all events, the study of the life-history of the manna plant in the future offers many interesting problems to the research workers at Khartoum, or elsewhere, if the plant can be obtained and cultivated.

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## NOTE ON THE DE-ARSENICATION OF SULPHURIC ACID BY HYDROGEN SULPHIDE.*

By T. S. Moore.

According to the published information, the strength of sulphuric acid submitted to de-arsenication by hydrogen sulphide must not exceed 110° Tw. (64.26 per cent. $H_2SO_4$), and in many works much less than this, down to 100° Tw. (59.7 per cent. $H_2SO_4$). The ex-

* From *Jour. Soc. Chem. Ind.*, December 15, 1919.

periments described in this paper were undertaken at a time when the demand for arsenic-free C. O. V. was very large and when all unnecessary concentration had to be avoided on account of shortage of plant, to find out whether more concentrated acid, particularly Glover tower acid of about 174° Tw. (80 per cent. $H_2SO_4$) could be de-arsenicated without prohibitive loss of sulphuric acid by reduction.

The experiments were carried out at the temperature of the laboratory. Hydrogen sulphide at the rate of one bubble a second was passed through 200 Gms. of the acid under examination, and the product filtered through asbestos in three separate portions: (1) Without any special precaution, (2) with hydrogen sulphide passing through the liquid while filtering, and (3) without precaution, after the liquid and precipitated arsenious sulphide had remained together for one or two days.

In de-arsenicating arsenical C. O. V. (95 per cent. $H_2SO_4$, 0.15 per cent. $As_2O_3$, 0.11 per cent. $As_2O_5$) it was found (1) that the process was slow, taking $2^1/_2$ hours in laboratory apparatus; (2) that excessive reduction of sulphuric acid occurred, the strength of the resulting acid being 91.8 per cent.; (3) that if filtration from the arsenic trisulphide is carried out immediately after the precipitation the arsenic content is 2 to 3 parts $As_2O_3$ per million, but that the arsenic content is higher the longer the filtration is delayed; and (4) that if hydrogen sulphide is passed through the liquid during filtration the arsenic content falls to less than 1 part $As_2O_3$ per million. Further, under the conditions last mentioned, the acid coming through the filter is perfectly clear, but soon becomes cloudy owing to the precipitation of sulphur, which shows that the rate of oxidation of hydrogen sulphide by strong sulphuric acid is not large enough to prevent the accumulation in solution of an appreciable quantity of the gas.

With arsenical C. O. V. diluted to contain approximately 80 per cent. of sulphuric acid it was found: (1) That the rate of reduction of the sulphuric acid is quite small (original acid contained 79.7 per cent $H_2SO_4$. After one hour's treatment with hydrogen sulphide, the acid contained 79.4 per cent. $H_2SO_4$. After two hours' treatment it contained 77.8% $H_2SO_4$); (2) that acid filtered immediately after one hour's treatment contained 1 part $As_2O_3$ per million, and the arsenic content was not diminished by passing hydrogen sulphide during filtration; (3) that when filtration was delayed

the arsenic content had risen only to 1.5 parts $As_2O_3$ per million. Two days after the acid has been filtered it still smells of hydrogen sulphide, which shows that the rate of reaction between hydrogen sulphide and 80 per cent. sulphuric acid is small.

The behavior of 70 per cent. acid resembles that of 80 per cent., the chief differences being that (1) de-arsenication is slightly more rapid, (2) filtration of the arsenic trisulphide may be delayed several days without any serious increase of the arsenic content, and (3) there is even less reduction of sulphuric acid.

Finally, an experiment with Glover tower acid of unusually high arsenic content was carried out, in which hydrogen sulphide in fine bubbles was passed through 500 Gms. of the acid contained in a bottle fixed on a shaking machine. One hour's treatment with hydrogen sulphide proved insufficient for this acid, and in a second experiment treatment was continued for $1^3/_4$ hours. Part of the product was filtered immediately and part after two days. The results of analysis were:

| | Before Treatment. % | After Immediate Filtration. % | After Standing Two Days. % |
|---|---|---|---|
| $H_2SO_4$ | 77.1 | 77.1 | 77.1 |
| $N_2O_3$ | 0.18 | None | None |
| $As_2O_3$ | 0.29 | Between 0.6 and 1 part in $10^6$ | |
| $As_2O_5$ | 1.58 | None | None |

These figures need some comment, for as they stand they give the impression that there is no loss of sulphuric acid. The following calculation shows that de-arsenication should actually cause an increase of the sulphuric acid content. The reactions proceeding are:

$$N_2O_3 + H_2S = H_2O + 2NO + S;$$
$$As_2O_3 + 3H_2S = As_2S_3 + 3H_2O;$$
$$As_2O_5 + 5H_2S = As_2S_3 + 5H_2O + 2S.$$

Thus, apart from absorption of water from the atmosphere and from reduction of sulphuric acid, 100 Gms. of the original acid containing:

| | | |
|---|---|---|
| 77.1 Gms. $H_2SO_4$ | | 77.1 Gms. $H_2SO_4$ |
| 0.18 Gm. $N_2O_3$ | should give | 0.05 Gm. $H_2O$ |
| 0.29 Gm. $As_2O_3$ | with $H_2S$ | 0.08 Gm. $H_2O$ |
| 1.58 Gms. $As_2O$ | | 0.63 Gm. $H_2O$ |
| 20.85 Gms. $H_2O$ | | 20.85 Gms. $H_2O$ |

*i. e.*, 100 Gms. of acid should become 98.71 Gms. after de-arsenication, so that the strength of the sulphuric acid in the de-arsenicated product should be $\frac{100 \times 77.1}{98.71} = 78.1$ per cent. Since it was found to be 77.1, there is an apparent loss of 1.3 per cent. of the sulphuric acid originally present. This figure cannot be taken as accurate, for absorption of water may have occurred, and, further, it is not possible in small experiments to estimate the yield of de-arsenicated acid at all exactly. But it can be taken that the loss of sulphuric acid by reduction is less than 1.3 per cent. of the original sulphuric acid. The loss could certainly be diminished by (*a*) using a more efficient apparatus for mixing the gas with the acid, (*b*) stopping the treatment before the de-arsenication had gone so far as the point reached in the experiment, and (*c*) using a Glover tower acid of more normal arsenic content, for all these conditions would diminish the duration of treatment.

From these experiments it is clear that for practically complete de-arsenication of acid of any strength up to 95 per cent. the only essential condition is that the acid after treatment must contain dissolved hydrogen sulphide, and so long as this condition is fulfilled the acid can stand in contact with the arsenious sulphide without any serious increase of arsenic content. As soon as the hydrogen sulphide has been destroyed the acid takes up arsenic again at a rate depending upon its strength.

E. Schmidt (*Arch. Pharm.*, 45: 255, 1917) states that although water, alcohol, and dilute solutions of hydrochloric acid cause appreciable decomposition of arsenious sulphide, such decomposition is prevented by the presence of small quantities of hydrogen sulphide. The above experiments shows that hydrogen sulphide has a similar effect, even in the presence of strong sulphuric acid. —Royal Holloway College (University of London).

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## MEDICINAL PLANTS IN BAHIA.*

By Consul Edward Higgins,

Bahia, Brazil, Nov. 1, 1919.

The State of Bahia, Brazil, offers to the medical world an abundant and varied supply of plants, roots, barks and gums, including many

* From *Commerce Reports*, Dec. 26, 1919.

of recognized value and some regular articles of export, such as ipecacuanha root, araroba powder, jaborandi leaves, and Jatoba gum. Most of the plants exist in practically inexhaustible quantities; but orders must be placed in advance with local exporters, for there is no regular trade even in those now figuring among the State's exports. The supply depends entirely upon the demand. There follows a list of the most important medicinal plants found at convenient distances from the city of Bahia:

*Angelica* (*Gentiana rubra*).—Aromatic, antiseptic and antispasmodic; a powerful remedy against intermittent fevers.

*Arco leaves.*—A substitute for the coca leaves of Peru; a stimulating and powerful tonic, yielding cocaine.

*Araroba or Goa Powder.*—This is a powder taken from the heartwood of a tree known locally as "armagoso do matto" (Vouacapoua araroba), which contains a substance known as chrysarobin, used in the treatment of skin diseases.

*Barbatimao Bark.*—The inner bark contains phosphate of lime, tannin and an alkaloid similar to quinine; it is a sedative, and reduced to powder makes an excellent dentifrice.

*Cajueiro* (*Anacardium occidentale*).—The bark is astringent and is an efficacious remedy against diabetes.

*Caroba leaves.*—Antisyphilitic and antibubonic; well known in Brazil as a powerful blood cleaner, used externally and internally. It is a vegetable mercury and is said to be superior to sarsaparilla and other blood purifiers.

*Cambará Leaves.*—A strong sedative and expectorant, for bronchitis, coughs and pulmonary ailments.

*Cameleao da costa.*—Remedy for stomach trouble.

*Cestrum Leaves.*—A strong narcotic, said to be poisonous, also used in baths against hemorrhoids, a powerful insecticide. The damp leaves are applied to wounds, first inflaming them, but afterwards cleaning and healing them.

*Congonha.*—A stimulant, diuretic as a tea.

*Gervao.*—One of the best disobstruents known, aids digestion and eases laborious births.

*Imbauba.*—Remedy against coughs, bronchitis and asthma.

*Imburana.*—Inner bark contains coumarin; it is aromatic, an expectorant and a stimulant.

*Ipecacuanha.*—This is a shrub growing in the shade of the forest, the root of which is dried and powdered for use in medicine. It is valued as an expectorant, diaphoretic and emetic. It is not cultivated, but care is taken in digging up the plants to leave sufficient roots in the soil for another crop.

*Jaborandi Leaves.*—Aphrodisiac, sudorific and stimulating. From these leaves is extracted pilocarpine, which is used in tonic preparations for the hair.

*Jurubeba* (*Solanum paniculatum*).—Remedy for congestion and maladies of the liver.

*Loco Leaf.*—A vegetable caustic.

*Carnauba Wax.*—A tasteless, aseptic wax extracted form the leaf of a palm tree known locally as the "carnaubeira" and employed in the preparation of ointments, pomades and pills.

*Mamona.*—This is Portuguese for the castor plant, which was introduced into Brazil from India and China by the earlier colonists, but spread so quickly as to have the appearance to-day of a forest plant. Both the seed and oil are exported from Bahia in increasing quantities each year.

*Manaca Root.*—Antisyphilitic vegetable mercury.

*Jatobá Gum.*—Jatobá is a name applied to several species of trees found in the valley of the River Sao Francisco, which traverses the northern and western parts of the State of Bahia. The gum which is extracted from this tree is employed in the composition of syrups for pulmonary affections. It is variously known, locally, as jatobá, jatahy and jutahy.

*Jatobá Bark.*—The bark of the above-mentioned tree is also of value in the preparation of medicines and is employed as an astringent and carminative.

*Mango Tree* (*Mangifera indica*).—The leaves are antiasthmatic.

*Menstrasto.*—A plant, stimulating against colics and used in fevers, also in baths to cure weakness.

*Milhomens* (*Aristolochia cymbifera.*)—Used against paralysis, dropsy and stomach trouble.

*Mulungu* (*Erythrina mulungu*).—The inner bark is a powerful sedative, narcotic and antispasmodic, and is a substitute for belladonna; it also exercises a special action on the liver; in doses of 5 centigrams it will induce sleep.

*Pareira Brava Root* (*Cissampellos pareira*).—A powerful tonic, remedy for stomach trouble, bladder trouble, beri-beri, brain fever and meningitis.

*Pao ferro.*—A bark used against diabetes; the seeds furnish a strong tonic and diuretic.

*Purga de campo.*—Remedy for fevers, pleurisy, tumors and cancerous wounds.

*Pindahiba.*—Remedy for stomach trouble and for intestinal flatulence.

*Quina-quina.*—A bark used against fevers.

*Quitoco.*—Carminative, antihysteric and digestive; used in baths for muscular pains in the body.

*Samambaia.*—Used for rheumatism.

*Velame de campo.*—Blood cleanser, antisyphilitic and anti-rheumatic, for skin diseases and swelling of the glands.

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## NOTES ON THE GINGER-BEER PLANT.*

By E. M. Holmes, F.L.S.

Although this curious substance has been used for many years, both in this country and the United Sta[illegible]original source appears to be unknown, and the names which are popularly given to it indicate a desire to keep its origin and nature a secret. Among the most far-fetched of the names under which specimens have been sent to me with inquiries as to its nature is "Balm of Gilead!"

Evidently the scientific examination of this substance by the late Dr. H. Marshall Ward, published in the *Proceedings of the Royal Society* as long ago as 1891 (Vol. 50, pp. 261–265), and

Fig. 1.—The Ginger-Beer Plant.

further elaborated in a second paper, published in the *Philosophical Transactions* of the same society in 1892 (p. 125), have been over-

* *The Pharmaceutical Jour. and Pharmacist*, Jan. 3, 1920.

looked by busy pharmacists, but the brief summary of Dr. Marshall Ward's researches given by Prof. Reynolds Green in his work on "Fermentation" (p. 321) should not have escaped notice, except for the fact that Prof. Green did not provide an alphabetical index to his otherwise excellent publication. The same fault applies to Salter's translation of D. L. Lafar's "Technical Mycology," in which, on pp. 256–267, illustrations of the two chief constituents of the ginger-beer plant are taken from Dr. Marshall Ward's paper. Both these two last-named works are in the library of the Pharmaceutical Society.

It may, however, serve a useful purpose if a summary of all that is at present known concerning the life-history of the ginger-beer plant be placed on record in the pages of the JOURNAL for future reference.

In appearance the ginger-beer plant bears some resemblance to pearl-barley that has been boiled, but the nodules vary in size from that of a pinhead to nearly an inch in diameter (see Fig. 1). It belongs to a class of symbiotic ferments in which a yeast and a bacterium live together, the one assisting in and promoting the work of the other. To this class belong also kephir, the ferment of koumiss, and a ferment found on the sugar cane in Madagascar. The first is used in the fermentation of cow's milk in the Caucasus, and the second in the fermentation of mare's milk in the steppes of South-west Siberia. The ginger-beer plant and the Madagascar ferment can ferment saccharose, maltose, glucose and fructose, but not lactose. In this particular feature they differ from the kephir and koumiss ferments, which can split up lactose. Kephir and the Madagascar ferment both have a similar appearance to the ginger-beer plant, but the koumiss ferment is not used in a separate state, a portion of fermented milk being added to some fresh milk when required. The products of fermentation are chiefly alcohol, carbonic acid and some lactic and acetic acids, and in the case of the Madagascar ferment some succinic acid, the acetic acid being formed directly from the sugar, and not through the medium of the alcohol.

When a few pieces of the ginger-beer plant are put in a 10–30 per cent. solution of cane sugar and the bottle put in a warm place fermentation takes place in about twenty-four hours and the liquid is then observed to become turbid, and bubbles of gas begin to ascend. This turbidity is due almost entirely to the yeast-cells which are shed from the nodules of the plant, which rise and fall

in the liquid and multiply in it, and form a grayish deposit at the bottom. The liquid becomes charged with carbon dioxide, and becomes more or less viscous, so that the gas-bubbles rise more slowly. This viscosity is due to the swollen or vermiform bacteria which become distributed throughout the liquid, which becomes acid as well as viscous. The chief products of the fermentation of the ginger-beer plant are carbonic and lactic acid, with traces of alcohol and acetic acid.

With regard to the constituents of the symbiotic ferment known as the ginger-beer plant, Dr. H. Marshall Ward found that it consisted chiefly of two plants, the one a yeast (*Saccharomyces pyriformis*) and a hitherto undescribed bacterium, to which he gave the name of *Bacterium vermiforme*, from its worm-like appearance under the microscope. The appearance of these two plants is shown in illustration 2 here given, taken from Dr. Ward's second paper, in the *Philosophical Transactions of the Royal Society* (p. 1251). The oval cells in Fig. 2 are those of the yeast *Saccharomyces pyriformis*, entangled in the worm-like filaments of the *Bacterium vermiforme*. These—which form the chief bulk of the ferment—are the two essential constituents in it, since Dr. Ward found

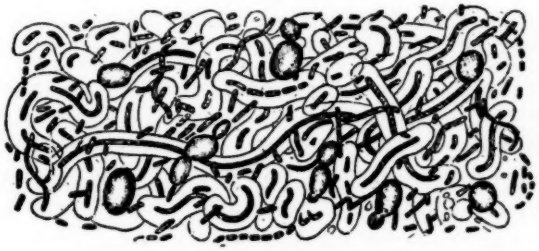

FIG. 2.—The Symbiotic Condition.

that it was possible, under proper conditions, to reconstruct the plant from pure cultures of these two plants isolated from a fermenting liquid. The bacterium filaments are generally much coiled and twisted together, sometimes broken into short rodlets, or even *cocci*, arranged in chains. The separate filaments are surrounded to a greater or less extent by a pellucid gelatinous sheath, and it is to this that the consistency of the ginger-beer plant is due. The sheath consists of the greatly swollen layers of the cell membrane, which may be developed on one side only or along part of its length, or may even be absent altogether. The branched form appears

to be due to a persistent one-sided development of these layers. The bacterium itself, as distinct from the sheath, measures about 0.5 $\mu$ in diameter, and varies from 0.5 $\mu$ to 5.0 $\mu$ in length, the sheath being often ten times the diameter of the cell. These thickened walls occur in many of the Nostocaceae, especially in the Oscillatoriae. The ginger-beer plant can be dried and shrunk up into a horny mass, in which condition it can be stored for future use.

Mr. E. R. Nichols, of Middlesbrough, who recently sent me a specimen, writes that it is largely used in that district in preparing a drink called a wine. For this purpose 4 ounces of sugar and 4 ounces of treacle are mixed with $1^1/_2$ pints of warm water to form the mother liquor. Small pieces of the plant are then added, and the mixture is kept in a warm place. Each day about a teaspoonful of sugar is added. There is brisk fermentation, and a palatable drink is soon ready. The ferment quickly increases, and can be used to prepare a fresh batch.

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## THE TEACHING OF THERAPEUTICS.*

By Hobart Amory Hare, M.D.,

Professor of Therapeutics, Materia Medica and Diagnosis, Jefferson Medical College, Philadelphia, Pa.

I am writing this paper because I am hopeful that it may direct attention to what is a crying fault in medical education to-day, namely, the neglect of teaching students how to treat patients for the alleviation or cure of disease. I am hopeful that some good may come of it because the Council on Pharmacy and Chemistry of the American Medical Association for years past has been endeavoring to inform physicians regarding the use of proprietary products and to persuade them to prescribe drugs, proprietary or not, intelligently.

The work that the Council had done is, of course, praiseworthy in intent, and is good as far as it goes in one line, to wit, to improve medical practice among graduates; but the prime difficulty lies in the teaching of practical therapeutics to the undergraduate and to the hospital intern. This embryo practitioner in almost every medi-

* Reprinted from *Jour. American Medical Association*, Feb. 7, 1920.

cal school has no training in pharmacy, little or no training in the use of the official names of drugs or of their doses, and no training whatever in the fact that doses of different sizes, although they be of one drug, may be useless, useful or harmful, or become so after some days. He, therefore enters practice utterly at sea when he is called on to write a prescription.

I have known of eye drops to be ordered by the quart, oleoresins mixed with aqueous solutions, powerful alkaloids, such as strychnine, put in a mixture with potassium iodide, whereby nearly all the strychnine went into the last dose, and a host of other errors too numerous to mention. I have seen a thousandth of a grain of arsenous oxide given three times a day to an adult, and a grain of atropine put in each pill; and no druggist exists who, if diplomacy did not restrain him, could not humiliate almost every physician whose recipes come to his shop. Because the medical man knows nothing of the bulk of drugs or the most efficient vehicles, or excipients, he takes the easiest way out of his dilemma and orders products already prepared, which products are often the result of much experience and scientific pharmacy.

The remedy for all this is to have every student make in a pharmacy laboratory at least one representative of each class of preparations official in the Pharmacopoeia and the National Formulary. I believe that this is done in only one school of medicine in the United States.

The young graduate, having had no experience or teaching as to doses, naturally used doses that some commercial laboratory names. He may have been taught "doses," but he has no idea that small doses of digitalis may be useful in one case, whereas almost toxic doses may be absolutely essential in another, and so loses the patient that needed the large dose. He uses the compound mixture of licorice as a vehicle in a case of profuse bronchorrhea or threatened pulmonary edema, not knowing, or forgetting, that its most active ingredient is antimony, which is absolutely contraindicated.

When he becomes an intern in a hospital, he learns one thing of great importance, namely, that the chiefs who prescribe little and "let the patient get well" often obtain the best results; or if he is on a surgical service, the entire drug therapy may be in his hands, and the chief often boasts that he "knows nothing about drugs and don't want to." On the medical side in large hospitals he will find a hospital formulary from which mixtures are made up by the gallon

with all sorts of drugs, and contradictions, with widely varying doses of the ingredients; but there is a standard dose of the whole mess whether it be for a young girl of 16 weighing 100 pounds or an old rounder weighing 200 pounds. Not only this, but these mixtures go by names which often do not mention the most active ingredient, or, worse still, go by numbers, so that the order on the treatment card reads: "No. 23, dessert-spoonful t. i. d."

The fault does not stop with internship. Never having been taught practical therapeutics, the man steps into practice a fair mark for the loquacious traveling salesman who places him in the vocative by being familiar with what he ought to know. Some years ago, telling a distinguished ex-president of the Association that a patient was getting acetphenetidin, I found he did not know it was phenacetin. When he was told that the first term was the official one, he laughed and admitted that he had asked a student what he would use in a given case, and the reply was "phenol." The clinician "long" on pathology but "short" on therapeutics then informed the astonished youth that "phenol was no doubt very good, but carbolic acid was better."

*Proper Method of Training the Student.*—The remedy for the state of affairs just described is in teaching and experience when a student. This, in my experience, which is a fairly large one, is best accomplished by having the student, in his course, not only taught doses by rule of thumb, but also given the opportunity to prescribe for suppositive or actual cases, and to see the results of his order, both as to the prescription itself and as to its effect on the patient. Under the direction of an assistant professor the whole class may attend a therapeutic conference, or quiz, on the treatment of a given class of diseases, and during the conference several of the men who advise plans of treatment are called to the blackboard to put in black and white what they have suggested. When they have finished, the instructor, who has continued his quiz in the meantime, criticizes the pharmacy, the doses, the form, the combinations, the therapeutics and the quantity in the whole prescription, as well as the Latin.

The number of occasions on which such criticisms lead to howls of delight at the discomfort of the man at the blackboard may be subversive of discipline, but all hands remember how John Jones wrote for nitrohydrochloric acid, iodide of potassium, tincture of

gentian and tincture of iron in a quart of water, particularly if the mixture is prepared forthwith.

This large class teaching is driven home by a junior teacher taking the class in sections and having it spend one or two hours a week for several weeks writing prescriptions, for suppositive cases, which are then criticized, and the writer asked to give his reasons for using each remedy.

The regular medical ward classes should emphasize therapeutics; and, in addition, clinical, not laboratory, pharmacology should be taught. This is done by demonstrating a case of auricular fibrillation both at the bedside and with the electrocardiograph, and then giving full doses of digitalis, a second demonstration revealing the effects. So, too, the mode of action of atropine in partial or complete heart block is demonstrated, and the effects of nitrites in lowering pressure are taught by seeing a patient to-day with high pressure and again at the next visit with a reduced pressure. Any number of these therapeutic demonstrations can be made by the regular ward class teacher, and made still more useful if a demonstrator of clinical pharmacology who can use the polygraph and electrocardiograph is given proper hours. By this means the student is taught how drugs act and how various doses act, entirely apart from the didactic lectures on therapeutics or the general therapeutic clinics given by the head of the department, who deals of necessity with principles and practice.

*Faults in Present Methods.*—All this seems so obviously practical that the question arises, "Why is it not done?"

The answer is that there is not time. If there is not, why not? There is not time for two chief reasons. The first is that the student is taught too much of the special art of the specialties, many of which he will never attempt to practice; and unless he takes a post-graduate course after several years in general practice, he ought not to try to practice. At present the young graduate can talk learnedly of the difference between paralytic and concomitant squint or about the Bárány test, but is stumped when told to write a recipe for diarrhoea.

The second reason is that the laboratory of pharmacology has drowned practical therapeutics, and has done it so effectively that in most schools literally no bedside therapeutics as a separate branch is taught, the original chair of therapeutics being filled by a lab-

oratory pharmacologist who in some instances is not even a doctor of medicine, or if he has the degree of M.D. has never practiced a day in his life or even been an intern in a hospital. When he attempts to tell students bedside facts, it is as if he were an astronomer trying to teach a sailor how to navigate a ship without ever having been to sea. As he lacks bedside experience, he teaches, for example, that the best treatment of fever is a combination of the cold bath and coal-tar antipyretics, when every one who practices knows that this is a great error. It is enough to bring the gray hairs of Dr. Simon Baruch, the great apostle of hydrotherapy, in sorrow to the grave, and if carried out will bring many patients there.

Valuable time which should be spent at the bedside learning how to use drugs is employed in having students carry out pharmacologic technic in a course of six or eight weeks or their equivalent. It is safe to say that not one man in a thousand who takes this course becomes a pharmacologist or learns to be an efficient technician. What the student needs is not to do the experiments himself but to see them done by a man so well trained that results are produced that make a demonstration that really demonstrates the fact to be remembered. I can see no more reason for making a group of students, designed to be practitioners, make bungling experiments with a Kronecker-Bowditch heart apparatus than I can for their performing amputations and visceral operations on dogs or cats with the idea that they will become good surgeons; indeed, there is less reason. One cannot make a man who has no music in his soul a violinist in a six weeks' course, and probably it is safe to say that the majority of excellent physicians have not the qualities which produce original contributions to medical knowledge.

*Need for the Teaching of Practical Therapeutics.*—To quote Sir George Makins,[1] in an address to the Medical Society of Manchester:

"A survey of these considerations should exert a definite influence upon the determination of the nature of the course of education best suited to the development of the doctor upon whose efficiency the happiness and health of the nation so largely depends. It is clear that for the great bulk of the profession a path must be found by which advances in science are utilized for the perfection of the art of medicine, but it cannot be possible to elevate every medical man to the position of an apostle of pure science. . . . . "

[1] Makins, *Brit. Med. J.*, 2: 590 (Nov. 8), 1919.

"All men are not endowed with a truly scientific spirit; the power of evolving great principles is reserved to the few, and even the correct appreciation and application of those which have been laid down is not a faculty universally enjoyed. Again, the power of reasoning, the possession of initiative and invention, and the facility of developing technical skill, are qualities very unevenly distributed among the class of man who adopts medicine as his profession. The reasons which lead to his choice are by no means always governed by the degree of aptitude he possesses for the calling he decides to follow. To some the science of medicine appeals; some adopt medicine from the lofty motive of desiring to benefit mankind; some boys are born to succeed to a family practice; some become students of medicine because the choice coincides with that of a friend; in some business capacity is nil; in others it is the mainspring of the future career and dominates all other feelings or aspirations. Lastly, in not a few instances the initial choice has never been made the subject of serious thought or consideration."

My point is not that there should not be teachers of pharmacology. On the contrary, there should be, because it is only by the efforts of these men that the scientific or investigative side of therapeutics can be advanced and the errors of empiricism corrected. Their existence develops those who have the talent, initiative, the proper deduction and the love of investigation, and their methods of thought and mode of study are examples of the highest type of medical man; but in their enthusiasm they should not forget that 999 of their pupils want to know how to make the sick well and do not want to know by personal experiments on dogs the effect, for example, of cutting the animal's sympathetic nerve, or the action of cocaine on the eye. If this is to be taught, let the pharmacologist make the experiment and demonstrate the result.

It may be said that I do not know whereof I speak; but I do, for I was once a pharmacologist myself. In the eighties I worked in laboratory pharmacology, and taught it, too, as a somewhat long list of titles in the Index Catalogue will show. I am not an iconoclast, and no one rejoices more than I do that the only pharmacologic laboratory in the United States in 1886 has been followed by two score of such laboratories from which a wealth of wonderful work was originated; but it is *postgraduate work*. I am pleading that hours now used otherwise may be employed to teach not only the theory but also the practice of therapeutics. When this is done, the work of

the Council on Pharmacy and Chemistry will be helped in its completion; for, when the practitioner knows how to prescribe, he will not tolerate the commercial concern that poses as his teacher.

The closing paragraph of a recent editorial[2] has a bearing on this subject. I have substituted the word "pharmacologist" for "physiologist," and "pharmacology" for "physiology."

"It is quite possible that, as has been suggested, we are approaching the time when there will be two types of persons connected with each clinical department, namely, the clinical pharmacologist, whose chief work will be the intensive study of selected groups of cases and the instruction of students in the application of the principles of pharmacology to the elucidation of disease, and the clinician, whose chief function will be the care of the patient and the instruction of the student in the practical methods of diagnosis and treatment. Obviously, some arrangement already exists in some of our better schools. In institutions in which full time medicine has been introduced, there has been a distinct effort to appoint as heads of the clinical departments men of the investigative type. One question that Addis' discussion raises is whether in our enthusiasm for laboratory research we have not overlooked the importance of purely clinical investigation and of the type of physician that naturally tends toward this."

At present an attempt is made to make pharmacologists out of men who are going to practice medicine. A real pharmacologist is a highly educated man in physiology and chemistry, an investigator, a discoverer, and by rights a leader in the higher realms of therapeutics—one who should teach medical students how drugs can be studied and should be studied in the laboratory, and to determine fundamental facts about remedies. But to try to train the general run of students, who will never have a laboratory, to be pharmacologists without first teaching elementary practical therapeutics, is somewhat like a great opera singer trying to make every one a great singer, or as if one should attempt to make his infant son sing before he tried to teach him to walk. The use of instruments of precision necessary for the study of drugs, if taught at all, should be at the bedside. I repeat what I said above: "The lack of training as to what to do, what not to do, and when to do, as to remedies, is one of the weak spots in medicine to-day." I firmly believe that

[2] "The Teaching of Clinical Medicine," editorial, *J. A. M. A.*, 74: 35 (Jan. 3), 1920.

if the present generation of students is properly taught practical therapeutics, the chief labor of the Council on Pharmacy and Chemistry will be an accomplished fact, for the right way will be the easiest way. Let us first make good physicians and from these may be sifted out those who can and want to become laboratory pharmacologists.

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## THE TRAINING OF PHARMACEUTICAL CHEMISTS.*

The sale of drugs and poisons is limited in most countries to certain persons. These persons become qualified for registration as pharmacists or pharmaceutical chemists after receiving a special training. In the various States of the Commonwealth of Australia the pharmaceutical student must reach a minimal standard of general education which is laid down by regulation. The student serves as an apprentice to a registered pharmacist for a number of years, whereby a knowledge is obtained of the practice of the profession. The student has sufficient opportunity of gaining acquaintance with his duties to render him proficient in the routine work of preparing drugs for medicinal use. This period is long enough to form habits of accuracy and attention, so that there will be little fear of mistakes occurring in the prepared medicines. In addition, the student attends courses of systematic instruction in botany, chemistry and *materia medica* at some college or university where these subjects are taught in an approved manner. The student acquires a knowledge of the various parts of vegetable substances and of the characteristic features of the plants from which the medicinal substances are derived. He is taught the chemistry of the principal inorganic and organic bodies, the outlines of qualitative analysis and the methods used for the quantitative estimation of the substances used as drugs. Above all, he is made familiar with the appearance of drugs, with their characters and with the tests to which they respond. Before registration the student has to satisfy examiners that he has attained proficiency in the subjects of study. At the termination of the period of instruction the pharmacist is able to recognize with ease the nature of the drugs with which he deals. In some States the student also re-

* From *Med. Jour. of Australia;* through *The Australasian Jour. of Pharm.*, Nov. 20, 1919.

ceives systematic instruction in respect to the preparation of drugs for administration.

Many drugs act in a potent manner on the functions of the body. If they are given in too large dose they behave as poisons and may lead to death. Their use depends upon their administration in exact quantity. The training of the pharmacist is designed to make him precise in his measurements and trustworthy in his use of drugs. The reliability of the pharmacist is dependent to a considerable extent on his ready knowledge of the appearance and characters of drugs and their preparations. This knowledge guarantees the accuracy of his dispensing practice.

The restriction of the retail sale of drugs to these trained persons has for its aim the preservation of the public against errors in the purchase of drugs. The nature of drugs is such that the purchaser must be protected as far as possible from mistake in respect to the article that has been bought. *Caveat emptor* has no application to the purchase of medicines. The qualities of drugs are in many instances laid down in a pharmacopoeia operative in the particular country. The pharmacist endeavors to ascertain that the drugs he sells are of the necessary purity. Persons who buy drugs from those who are not registered pharmacists, do so at their own risk. They make no use of those safeguards which have been laid down for their protection. They must abide by the consequences of their act. When the purchase is made from a registered pharmacist, the buyer has a right to receive an article of the nature that he demands. The pharmacist is bound to use reasonable care in obtaining drugs and in dispensing them. On him rests the responsibility of making sure that he uses pure drugs and that these are measured in an accurate manner. In return the public owes to him the duty of seeing that his trade is not invaded by untrained persons with no specific knowledge of drugs and their use.

Accidents will happen. There are no means by which they can be completely abolished as long as powerful poisons are used as drugs. They will be less frequent when the dispenser is aware of the accumulated experience of the ages in the methods of guarding against them. They will be diminished in number with increased knowledge of the behavior of particular drugs under different circumstances. In this case, knowledge may mean power to avert the consequences of an error that has been already made.

## BOTULISM FROM RIPE OLIVES.*

For the fourth time within a few months a highly fatal outbreak of botulism due to ripe olives is recorded in our columns. The article on an outbreak of botulism in New York in the JOURNAL[1] this week follows close on the heels of the report of the Memphis outbreak in our "General News" of last week. These added to the outbreaks at Canton, Ohio, and Detroit, make a formidable showing.

Three of the four outbreaks appear to have been traced to one brand of olives, packed in southern California, a fact that we believe should be given wide publicity at this time, even if commercial interests suffer. It seems at all events as if all local health authorities should make systematic attempts to find out whether this particular brand of olives is being distributed within their jurisdiction. It is only the part of prudence and good common sense to make sure so far as possible that olives of this brand are not being "salvaged" and perhaps distributed to scores of small groceries and delicatessen shops throughout the country.

Two particularly disturbing features characterize these later outbreaks, one being that the olives apparently responsible for the New York outbreak were not of the same brand as those causing botulism in Canton, Detroit and Memphis. If it is true that more than one brand of olives is involved in the causation of botulism, the difficulties that public health authorities will have in coping with this menace are measurably increased. It is evident also that the whole ripe olive industry should be subjected to investigation and supervision. Steps in this direction have already been taken, as is also noted in our news columns. Thus far green olives do not seem to have been implicated in the causation of botulism.

The second point about which concern may well be felt is the seeming willingness of unscrupulous dealers to sell olives and perhaps other foodstuffs that have been condemned. We are informed that the olives causing death in Memphis were obtained from a store of which the principal business is buying and selling salvaged merchandise. In this case, olives found in a dish on the table at the house where they were served had a very objectionable and pronounced foul odor. In the New York outbreak, a distributing com-

* From *Jour. Amer. Med. Assoc.*, Feb. 21, 1920.

[1] Sisco, D. L.: "An Outbreak of Botulism," *J. A. M. A.*, Feb. 21, 1920.

pany in New York City refused to put the olives on the market under their label, but the jars were resold by the California olive company that packed them and were shifted about from place to place for some months, many being rejected during their circulation because they were obviously spoiled and unfit for sale. From the information available it does not seem clear that the olives that were eaten in New York had a definitely spoiled odor. The only evidence from those eating the olives came from one victim shortly before death, who stated that he noticed nothing wrong about the odor or taste, and from one 9-year-old child, who also noticed nothing disagreeable in taste or odor. Although a half bottle of ripe olives, probably the one that contained the toxin, was found in the home of the victims, no statement is made about the physical condition of these olives.

It seems clear that immediate and drastic warning should be given to dealers regarding the sale of ripe olives showing any signs of spoiling. It is also true that at least until fuller information is available, salvaged food, particularly olives, should be regarded with considerable suspicion by the general public.

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## ANNOUNCEMENTS.

### A Grant for Pharmaceutical Research.

The American Pharmaceutical Association has available a sum amounting to about $450, which will be expended after October 1, 1920, for the encouragement of research. This amount either in full or fractions will be awarded in such manner as will in the judgment of the A. Ph. A. Research Committee produce the greatest good to American pharmaceutical research.

Investigators desiring financial aid in their work will communicate before May first with H. V. Arny, chairman A. Ph. A. Research Committee, 115 West 68th St., New York, giving their past record and outlining the particular line of work for which the grant is desired.

The committee will give each application its careful attention and will make recommendations to the American Pharmaceutical Association at its meeting in Washington, May 3–8, 1920, when the award or awards will be made.

### The Scientific Section of the A. Ph. A.

During the Annual Convention of the American Pharmaceutical Association, which will be held in Washington, D. C., on May 4th to 10th, 1920, the Scientific Section will hold its meetings on Thursday, Friday and Saturday, May 6th, 7th and 8th. Those desiring to read papers before this section should submit them to the Secretary, Dr. A. G. Du Mez, Hygienic Laboratory, U. S. Public Health Service, Washington, D. C., not later than April 1st.

### The Section on Practical Pharmacy and Dispensing of the A. Ph. A.

The Section on Practical Pharmacy and Dispensing is endeavoring to make its program for the May Convention Meeting at Washington, unusually attractive and valuable.

Contributors to the Section must get their papers in earlier in the year than usual. In order to get titles and a brief abstract of the papers submitted to the general secretary in time for publication in the main program, it will be quite necessary to have these facts at our disposal early in April.

Practical papers for presentation at our sessions will be welcomed.

Send papers to Ivor Griffith, Secretary, Stetson Hospital, Philadelphia, Pa.

### Government Needs Chemists, Physicists, Etc.

The United States Civil Service Commission announces that the Government service is in need of a large number of chemists of various kinds. During this period of readjustment, technical men are especially needed. Besides chemists it is stated that there are openings for physicists, ceramic assistants, laboratory assistants and aids; metallurgical, technical and electrical laboratorians, etc.

Further information and application blanks may be obtained from the secretary of the U. S. civil service board at Boston, New York, Philadelphia, Atlanta, Cincinnati, Chicago, St. Paul, St. Louis, New Orleans, Seattle, or San Francisco, or from the U. S. Civil Service Commission, Washington, D. C.

### Annual Meeting of the American Drug Manufacturers' Association.

The Ninth Annual Meeting of the American Drug Manufacturers' Association will be held at the Hotel Biltmore, New York

City, April 12–15. The Scientific Section will hold a morning and afternoon session on Monday, April 12, and a morning session Tuesday, April 13, while the Biological Section will hold one session only on the afternoon of April 12. The sessions of the Association as a whole will begin on the afternoon of Tuesday, April 13.

The business sessions will be devoid of all purely formal features and will be devoted to practical discussion of important trade problems, notably the alcohol regulations, the return of unsalable goods, freight and express allowances, guarantees against declines in price, and kindred problems.

In connection with the discussion of the alcohol problem, the committee on arrangements hopes to induce Mr. Adams, of the Bureau of Internal Revenue, to address the Convention.

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## NEWS ITEMS AND PERSONAL NOTES.

PHILADELPHIA RECEPTION TO RETURNED SOLDIER AND SAILOR PHARMACISTS.—The various pharmaceutical and drug trade organizations of Philadelphia arranged, through a committee representing these organizations, a public reception and dance for returned soldier and sailor pharmacists. The function was held at Lulu Temple on the evening of Friday, February 27th, and was a marked success.

Mr. Edward T. Hahn was chairman of the committee that made every one of the 800 participants and especially the more than 200 service men feel thoroughly at their ease and enjoy the occasion to the fullest. Among the men who had been in the military service of the country and who made addresses were Karl P. Ehman, who took as a subject, "With the Guns," and Thomas J. Devine, who spoke for "The Navy." A stirring patriotic address by Captain Donald Kirk was followed by a silent tribute in honor of the men who had made the "sublime sacrifice."

Dr. Robert P. Fischelis, chairman of the World War Veteran Section of the American Pharmaceutical Association, presented to each of the service men in attendance a free membership in the A. Ph. A.

Ample refreshments and music interspersed the addresses and the evening was closed with dancing; the occasion was declared as one of the most enjoyable affairs ever held by the drug trade of the Quaker City.

PROF. GREENISH HONORED.—The University of Paris has conferred upon Professor H. G. Greenish, one of the leading pharmacognocists of the world and professor of pharmaceutics to the Pharmaceutical Society of Great Britain, the degree of Doctor, *honoris causa* of the University. American pharmacists are not unacquainted with the work and scientific attainments of Henry George Greenish and, in 1913, in recognition thereof he was elected to Honorary Membership in the American Pharmaceutical Association. He was the recipient of the Hanbury gold medal awarded last year. On the occasion of this additional honor bestowed upon this eminent pharmaceutical authority, the AMERICAN JOURNAL OF PHARMACY is indeed pleased to extend its sincere congratulations.

REMINGTON HONOR MEDAL TO BE AWARDED TO PROF. LLOYD.—The committee of former presidents of the American Pharmaceutical Association upon whom devolves the duty of selecting the recipient for the award of the Joseph P. Remington Memorial Medal, in recognition of exceptional services in behalf of pharmacy, have decided that the medal shall be awarded, in 1920, to Prof. John Uri Lloyd, of Cincinnati, Ohio. The numerous contributions to pharmacy that for many years have come from Prof. Lloyd, his scientific and literary attainments and his devotion to pharmaceutical interests are to be thus commended and honored. The medal has been provided by the New York branch of the A. Ph. A. and the award will be made at an early date at an appropriate opportunity.

THE WOOD ALCOHOL MENACE.—Dean Charles H. LaWall has contributed in *The Forecast* for February a very instructive and popular article on the important subject of "Wood Alcohol—A National Peril." The widest dissemination of the knowledge of the toxic action of wood alcohol and the danger to life and health from its use as an adulterant in beverages, foods and medicines is at this time especially necessary and in this published article we have a happy combination of the scientific and press efforts to make every intelligent person acquainted with this fact. The possibility of toxic action developing even from inhalation of the vapors of methyl alcohol, wood alcohol, when used as a solvent in paints, varnishes, etc., is very rightly presented in the article and the public should be warned against the lurking danger from this otherwise legitimate use of methyl alcohol.

PROFESSOR YOUNGKEN, CONTRIBUTING EDITOR TO BOTANICAL ABSTRACTS.—Prof. Heber W. Youngken, head of the Department of Botany and Pharmacognosy of the Philadelphia College of Pharmacy, has recently accepted the invitation to assume charge of the Section on Pharmaceutical Botany and Pharmacognosy of the important compilation being published as *Botanical Abstracts*.

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## BOOK REVIEWS.

The Eleventh Edition of the THE AMERICAN POCKET MEDICAL DICTIONARY containing the pronunciation and definition of all the principal terms used in Medicine, Surgery, Dentistry, Veterinary Medicine, Nursing and kindred sciences; with over sixty extensive tables; edited by W. A. Newman Dorland, A.M., M.D., has just appeared.

This volume, though handy in size, contains 717 pages. The alphabetical arrangement of words is in heavy type, with definitions in lighter type, facilitating usage. The vocabulary, arranged alphabetically and comprising 682 pages, contains practically all of the modern medical terms. The definitions, although necessarily brief, are quite lucid.

Many tables have been added under their respective headings which correlates much information at a moment's glance. A table of doses in both the Apothecaries' and Metric Systems, embracing 34 pages, concludes the volume.

The spelling of the Alkaloids seems to lack the final "e" as Strychnin, Morphin, Cocain, Codein, etc., while the United States Pharmacopoeia gives the spelling for these Alkaloids with the final "e."

The book, aside from this, takes its place as a good Pocket Medical Dictionary, especially for the medical student.

MITCHELL BERNSTEIN, M.D.

PROCEEDINGS EIGHTH ANNUAL MEETING OF THE AMERICAN DRUG MANUFACTURERS' ASSOCIATION.—The proceedings of the eighth annual meeting of the American Drug Manufacturers' Association, held at the Waldorf Astoria Hotel, New York, March 24–27, 1919, in book form has now been distributed. The initial statement of the "Foreword" that "Between the covers of the book you now

hold is something of direct and practical interest to you, regardless of your position," is fully justified by perusal of this volume. It is certainly different from the stereotyped style of association proceedings of former days. It indicates that the Drug Manufacturers' Association is a live organization and that at its meetings the members are discussing questions of vital importance to the progress of the nation as well as those that are specifically connected with the commerce and manufacture of medicines.

The address of the President and the report of the Secretary present much food for thought in the various topics presented under such headings as "Tendencies Toward Socialism," "The High Cost of Paternal Legislation," "Politics and the High Cost of Living," and "Evils of Blind Partisanism."

The discussions upon legislation, both enacted and proposed, are enlightening and it would be well indeed if many of those interested in the various branches of the drug trade would read and study these. The various questions of especial interest as trade problems are not at all sidetracked nor were the scientific matters overlooked. The Proceedings of the Scientific Section, formerly the Committee on Standards and Deterioration, present a number of valuable scientific and research questions that had been under consideration during the year and the findings will prove of material aid in the revision of official standards already established and in fixing proper tests for some other substances for which standards have not been definitely determined. G. M. B.

DIGEST OF COMMENTS ON THE PHARMACOPOEIA OF THE UNITED STATES OF AMERICA AND ON THE NATIONAL FORMULARY FOR THE CALENDAR YEARS 1915 AND 1916.—These two pamphlet publications comprising *Hygienic Laboratory Bulletins*, 118 and 119, have been compiled by A. G. Du Mez of the Division of Pharmacology and carry on for two more years the work of compiling the criticisms upon our legal authorities for standards for drugs. The books now in hand continue the same general style of presenting the subjects as adopted with the inception of this work by the late M. I. Wilbert. The United States Public Health Service in undertaking this important piece of work and continuing same systematically is performing a notable service to all of the interests concerned in the establishment of correct standards for medicines and indirectly is performing a valuable service to the public who are the final consumers and whom it is aimed to serve. G. M. B.

## OBITUARY.

### EUGÈNE COLLIN.

In the decease of Eugène-Jean-Baptiste Collin on December 22, 1919, France has lost one of her most prominent scientists who occupied a prëeminent position in the field of microscopy and anatomical structure of drugs and foods and who had devoted his life in a modest yet most effective manner to scientific study. He was born at Carignan, Ardennes, on June 22, 1845. At an early age he obtained his education as bachelor of letters and sciences and then applied himself to pharmacy. He was a hospital interne in 1868 and during this period wrote his first paper on materia medica for which he was awarded the first prize.

In 1871 he arrived at the distinction of a pharmacist, first-class, and on this occasion presented a thesis on the structure of the official rhubarbs. He determined to apply himself to the microscopic study of drugs and foods and the detection of adulterants and sophistications, a branch of science which at that time was but little explored. His investigations covered a multitude of substances and his contributions to scientific literature were numerous and on a diversity of subjects. Among these may be mentioned his studies of starches, canella, pepper, coffee, tea, cinchona, cantharides and marjoram.

Associated with another name familiar to students of botany of drug plants there was published "The Vegetable Origin of Simple Drugs," by Planchon and Collin, in which Collin prepared the major portion of the work. In 1894, he published "A Guide to the Practical Determination of Officinal Powders;" in 1902 appeared his "Précis de Materia Médicale;" and in 1907 a "Treatise on Vegetal Toxicology," being a study of the application of the microscope to the study of the vegetable poisons. In 1905, there was published "An Anatomical Atlas of Vegetable Drugs," by Henry George Greenish and Eugène Collin.

His work was not without due appreciation and recognition and Collin was elected to honorary membership in many pharmaceutical societies. He was an honorary member of the Philadelphia College of Pharmacy and only last year was elected to honorary membership in the American Pharmaceutical Association. He received the award of the Hanbury medal in 1903.

By appointment of the Minister of Commerce, he held the position of microscopist in the central laboratory for the suppression of frauds and here his work for many years, and especially during the world war, is said to have been of inestimable value to his fellow countrymen.

G. M. B.